DOCUMENT RESUME

ED 284 689 PS 016 781

AUTHOR Robinson, Irene S.
TITLE A Program to Incorporate High-Order Thinking Skills into Teaching and Learning for Grades K-3.
PUB DATE 87
NOTE 110p.; Ed.D. Practicum, Nova University.
PUB TYPE Reports - Research/Technical (143) -- Reports - Descriptive (141) -- Dissertations/Theses - Practicum Papers (043)

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS *Cognitive Processes; *Creative Thinking; *Critical Thinking; Grade 3; *Inservice Teacher Education; Primary Education; Teacher Effectiveness; *Teacher Workshops; Teaching Methods
IDENTIFIERS Blooms Taxonomy; *Higher Order Skills; Junior Great Books Program; *Thinking Skills

ABSTRACT

This practicum was designed to organize and implement an effective thinking skills program to enhance higher-order thinking in children. The program's goals were (1) to provide a series of in-service training sessions designed to improve participants' teaching skills and motivate participants to use various teaching strategies in order to bring about positive changes in the thinking processes of students; (2) to use the Junior Books program to further assist third grade children in thinking interpretively; and (3) to encourage teachers to practice in class effective teaching models that enable children to think on higher levels of complexity. The 18 teachers who participated in the implementation attended all in-service sessions, developed effective strategies for teaching thinking skills, and held positive attitudes toward the thinking skills program. In addition, the 78 participating third grade students showed positive gains on all levels of Bloom's Taxonomy of Educational Objectives. (PCB)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED284689

PRACTICUM REPORT

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☒ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

Center for the
Advancement of Education
Ed.D. Program

A Program to Incorporate High-Order Thinking Skills into Teaching and Learning for Grades K-3

PS 016781

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Irene S. Robinson
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

3301 College Avenue
Fort Lauderdale, Florida 33314
305/475-7300

NOVA UNIVERSITY

A Program to Incorporate High-Order Thinking Skills into Teaching and Learning for Grades K-3

by

Irene S. Robinson

Cluster XV

A Major Practicum Report Presented to the Ed.D. Program
in Early Childhood
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

NOVA UNIVERSITY

1987

PS 016781

PRACTICUM APPROVAL SHEET

This practicum took place as described.

Verifier: Barbara B. Talley (signature)

Name Barbara B. Talley

Teacher

Title

203 Cousin Lucy's Lane
Warrenton, North Carolina 27589

Address

May 20, 1987

Date

This practicum report was submitted by Irene S. Robinson under the direction of the reviewer listed below. It was submitted to the Ed.D. Program in Early Childhood and approved in partial fulfillment of the requirements for the degree of Doctor of Education in Early Childhood at Nova University.

Approved:

Polly W. Peterson, Ph.D.

Date of Final Approval of Report

Polly W. Peterson, Ph.D.

ACKNOWLEDGMENTS

The writer wishes to acknowledge the many individuals who have encouraged and guided her to the completion of this practicum. She will not attempt to name all of them. Though unnamed, they are not forgotten.

Above all, the deepest gratitude is owed to the Creator; without His divine guidance, the practicum would have been impossible.

Knowing that behind every practicum at Nova University, there is a reviewer who has kept it moving and organizing the "disorganized." For this kind of assistance and inspiration, the writer thanks her advisor, Dr. Polly W. Peterson.

Special acknowledgment is made of the fine typing services of Nancy Tunstall, whose diligent work was so important in the completion of this report.

In particular, the writer owes her sincere thanks to the students and teachers of Mini City School who have shown her how cooperative they can be when a task is at hand.

I.S.R.

May, 1987

TABLE OF CONTENTS

Page

TITLE PAGE i

APPROVAL PAGE. ii

ACKNOWLEDGMENTS. iii

TABLE OF CONTENTS iv

LIST OF TABLES AND FIGURES vi

ABSTRACT vii

Chapter

I. INTRODUCTION 1

Description of Community Including Economic and Geographic Factors 1
Writer's Role and Responsibilities 2

II. STUDY OF THE PROBLEM 4

Statement of Problem 4
Documentation of the Problem Situation . . 5
Analysis of the Problem 6
Relationship of the Problem to the Literature 7

III. ANTICIPATED OUTCOMES AND EVALUATION INSTRUMENTS 18

Goals and Expectations 18
Terminal Performance Objectives 18
Mechanism for Recording Unexpected Events . 19
Measurement of Objectives 20
Description of Plans for Analyzing Results 21

IV. SOLUTION STRATEGY 22

Discussion and Evaluation of Possible Solutions 22
Description and Justification for Solution Selection 23
Report of Action Taken. 25

TABLE OF CONTENTS (Continued)

Page

V. RESULTS, CONCLUSIONS, AND RECOMMENDATIONS . . . 58

Results 58
Conclusions 65
Recommendations 65
Dissemination 66

REFERENCES 67

APPENDICES

A: Needs Assessment Survey 71

B: Teacher's Self-Evaluation Checklist on Thinking Skills 74

C: Participant Evaluation of the Staff Development Activity 77

D: Classroom Observation Checklist 79

E: Thinking Skills Test 83

F: Request for Permission to Reprint 88

G: Permission to Reprint 90

H: A Calendar Plan for Action. 93

I: The "Basics" of Tomorrow. 98

J: National Assessment Results 100

K: Reading, Thinking, and Writing. 102

L: A Place Called School 104

M: Bloom's Taxonomy of Cognitive Skills. . . . 107

N: Ways to Improve Student Thinking. 109

O: A Model of Metacognitive Thinking Skills. . 111

P: Thinking Skills Certificate 113

Q: Sample Memo of Dissemination. 115

LIST OF TABLES AND FIGURES

Page

Table

1 Teachers Achieving Mastery of Teaching Thinking Skills Behaviors 62

2 Percentage of Children Achieving Mastery of Thinking Skills. 64

Figure

1 Teacher - Pre- and Post-Self-Evaluation Results . 59

ABSTRACT

A program to Incorporate Higher-Order Thinking Skills into Teaching and Learning for Grades K-3. Robinson, Irene S., 1987: Practicum Report, Nova University Ed.D. Program in Early Childhood Education.
Descriptors: Cognitive Processes/Comprehension/Critical Thinking/Discussion (Teacher Techniques)/Divergent Thinking/Early Childhood Education/Evaluative Thinking/Inquiry/Inservice Teacher Education/Learning Processes/Learning Styles/Problem Solving/Questioning Techniques/Staff Development/Teacher Behavior/Teacher Effectiveness/Teaching Styles/Workshop

The practicum was designed to organize and implement an effective thinking skills program that enhanced higher-order thinking. The program's goals were: (1) to provide a series of inservice training sessions for teachers to increase their teaching efficiencies and to motivate them to utilize various teaching strategies in order to bring about positive results in the thinking processes of students, (2) to utilize the Junior Books program to further assist third grade children in thinking interpretively, and (3) to practice effective teaching models in the classroom that enabled children to think on higher levels of complexity.

Of the 18 teachers who participated in the implementation, 100% of them: (1) attended all inservice sessions, (2) developed effective teaching thinking skills behaviors, and (3) developed positive attitudes toward the thinking skills program. In addition, the participating 78 third grade students showed positive gains on each of the following levels of Bloom's Taxonomy of Educational Objectives: (1) knowledge, (2) comprehension, (3) application, (4) analysis, (5) synthesis, and (6) evaluation.

CHAPTER I

INTRODUCTION

Description of Community Including Economic and Geographic Factors

The community (hereafter referred to as Mini City) is a rural town, located in the southeastern part of the United States, and is characterized as an agricultural area with few industries. The majority of the families secure their income from industrial employment in surrounding areas. Agriculture has followed the trend toward mechanization, resulting in fewer jobs in the area.

Mini City has an approximate population of 1,100. The county in which Mini City is located has an estimated population of 17,000.

The racial makeup of the county is approximately 59% black, 37% white, and 4% Indian. Mini City has an approximate population of 19% black, 81% white, and less than 1% Indian.

The per capita income for the county in 1980 was $6,608. The unemployment rate was 10% for December, 1985. The educational norm for adults who are 25 years of age and over is considered low, as compared to other areas in the southeast. Approximately 37% of the citizens have completed high school. At least 14% of the residents have had some college training and approximately 2% of the residents are college graduates.

The county's school system consists of one high school, two middle schools, and five elementary schools.

The setting for this practicum is a K-3 school (hereafter referred to as Mini City School) with a professional staff consisting of a full-time principal, 14 classroom teachers, an EMH/LD teacher, a media specialist, an itinerant speech/language specialist, and an itinerant teacher of the academically gifted. The student enrollment is approximately 360. The student racial makeup

consists of 71% black, 13% white, and 16% Indian.

Writer's Role and Responsibilities

The writer's primary responsibility is to teach a self-contained third grade class at Mini City School. She is supervised by the principal. Major duties and responsibilities that are assigned by the local board of education include, but are not limited to the following:

1. Creating a classroom environment that is conducive to effective learning and appropriate to the maturity and interests of the students.
2. Employing a variety of instructional techniques and instructional media, consistent with the needs and capabilities of the individuals or student groups involved.
3. Diagnosing students' needs on a regular basis and cooperating with other professional staff members at the school and county level in helping students solve health, attitude, and learning problems.
4. Communicating with parents through conferences and other means to discuss the students' academic and behavioral progress and interpret the school program.
5. Translating lesson plans into learning experiences to best utilize the available time for instruction.
6. Assisting in the selection of books, equipment, and other instructional materials.
7. Cooperating with other members of the staff in planning instructional goals and methods.
8. Participating on faculty committees and sponsoring pupil

activities.

9. Providing for professional growth through an ongoing program of reading, attending county and state-sponsored workshops, seminars, conferences, and/or taking advanced course work at institutions of higher learning.
10. Contributing to positive working relationships among members of the staff of the school system, and presenting a positive professional image to the general public.

The writer complies with other duties and responsibilities as assigned by the Board of Education and/or the administration of the school system.

CHAPTER II

STUDY OF THE PROBLEM

Statement of the Problem

Recently, the teaching of thinking skills has become a high priority on the agenda of many educators, chiefly because the thinking tools that are necessary for effective understanding of the technological world include communication and higher problem-solving skills as well as scientific and technological literacy (The National Science Board Commission on Pre-College Education in Mathematics, Science, and Technology, 1983). While numerous educators value thinking and employ methods that encourage its development, a number of probing studies, according to McTighe and Schollenberger (1985), indicates that these educators do not represent the norm.

The teaching of thinking skills is particularly important to the success of all early childhood programs because it prepares young children to better understand and cope with an ever-changing society. Yet, the teaching skills of problem-solving, reasoning, conceptualization, and analysis are among the neglected basics needed in tomorrow's society (Association of Supervision and Curriculum Development, 1984). Further, Edward de Bono (1983) stated that the teaching of thinking is not tomorrow's dream, but today's reality.

While the importance of cognitive development has become widespread, students' performance on measures of higher-order thinking ability has displayed a critical need for students to develop the skills and attitudes of effective thinking (Hughes, 1985). Teachers must be motivated to re-examine their teaching effectiveness in order to improve the quality of teaching thinking. Careful consideration should be focused on inservice training, brain research, and learning styles in order to help students become productive thinkers.

Ideally, an effective thinking skills program provides opportunities for children to become higher-leveled, independent, and divergent thinkers, thus providing children with chances to solve problems by thinking both critically and creatively. In addition, an effective thinking skills program skillfully trains teachers to teach for thinking effectively. Therefore, teaching thinking becomes an integral part of the total curriculum and thus becomes a prerequisite skill for all other curricular activities.

Briefly stated, this problem addresses the serious lack of teaching effectiveness of higher-order thinking skills at Mini City School.

Documentation of the Problem Situation

The lack of the teaching effectiveness of higher-order thinking skills was well documented.

During the school year 1984-85, when the school was completing a self-study report for re-accreditation by the Southern Association of Colleges and Schools, it addressed higher-order thinking skills as an area of needed improvement.

In spring of 1986, a needs assessment was conducted (Appendix A). The survey revealed that:

1. Most teachers lacked effective questioning strategies.
2. There was a lack of teaching for divergent thinking.
3. There was a need to teach thinking as a process and not a product.
4. As a unit, the faculty needed to talk about the nature of thinking.
5. The faculty lacked collaborative instructional problem-solving.
6. The faculty could learn from their colleagues by observing one

another teach.

7. The teachers and the instructional leader seldom discussed ways to challenge students to think in more complex fashions.

Conversations and interviews with various members of the faculty indicated that the teachers and the principal were unhappy with the teaching of thinking as it currently existed. The primary concern was that the teachers were willing to effectively teach for higher-order thinking, but that they did not know how to correctly proceed in doing it. When asked if they knew how to develop lessons using the questioning levels as recommended by Bloom and his associates (1954), most teachers did not, though some were familiar with the model.

Analysis of the Problem

Several probable causes of the problem for the lack of the effective teaching of higher-order thinking were considered.

The first main probable cause of the problem was the lack of inservice training for teachers. Many teachers had received limited training in the area of teaching higher-order thinking skills while none of the teachers had attended any conferences on the topic. Many teachers were also unaware of the various techniques and effective models utilized to teach higher-order thinking. The lack of training and orientation for teachers contributed highly to the program's ineffectiveness.

The second main probable cause was the heavy reliance on textbooks. In many cases, textbooks determined what was taught and how it was to be taught. Teachers used textbooks because they feel comfortable using them. According to Nicely (1985), textbooks are not doing an effective job of actively involving students in the development, practice, and acquisition of higher-order thinking

skills.

The third main probable cause of the problem was the low priority placed on the teaching of higher-order thinking skills. Teachers feel pressured to teach facts and recall, thereby causing the teaching of higher-order thinking to become secondary. In a study involving more than 1,000 classrooms in a variety of settings throughout the country, John Goodlad (1984) found that an average of 75% of the class time was spent in instruction and approximately 70% of this time involved verbal interaction in which teachers were talking more than the students by a ratio of three to one. It was also found that less than 1% of this talk invited students to engage in anything more than mere recall of information. The National Council for the Social Studies, Developing Decision-Making Skills (Kurfman & Cassidy, 1977) commented that learning only easily teachable fact-finding skills will prove increasingly inadequate for survival in the modern world. Much more than fact-finding skills, that is, higher thought processes, useful knowledge, and clear values, are essential for students to function effectively.

The probable causes of the problem of the ineffectiveness of teaching of higher-order thinking skills lead to the conclusion that higher-order thinking, a most essential curricular item, vital for survival, was neglected chiefly due to lack of awareness and preparation.

Relationship of the Problem to the Literature

Teaching children to become effective thinkers is increasingly recognized as an immediate goal of education (Hughes, 1985). If students are to function successfully in a highly-technical society, then they must be equipped with life-long learning and thinking skills necessary to acquire and process information within an ever-changing world. Robert Ornstein (1980) stated that solutions

facing modern society demand a universal, qualitative improvement in thinking and understanding. Society is slowly and painfully becoming aware that such diverse contemporary challenges as energy, population, the environment, health, psychological well-being of individuals, and meaningful education of the youth are not being met by the mere accumulation of more data or expenditure of more time, energy, or money. In light of the increasing pressures imposed upon our society by these dilemmas, many responsible thinkers have realized that one cannot sit back and hope for technological inventions to cure the social ills (Ornstein, 1980).

Schools are falling short in their efforts to improve the thinking of its youth (Goodlad, 1984). Even though many schools claim to teach thinking skills, in reality, few do (Beyer, 1983).

In a rapidly changing society, all citizens will be faced with a situation that requires preparation to tackle new tasks, solve new problems, and learn new skills (Bondy, 1984). Therefore, Bondy (1984) suggested that metacognitive abilities of self-regulation, self-control, and self-direction are critical to the success of the future. As McTighe and Schollenberger (1985) pointed out, effective thinking is particularly important for contemporary democracy as local, national, and international issues become increasingly complex. They further (1985) added that additional research attesting to the need could be cited, but the message is clear - educators need to make renewed efforts to bring about effective improvement in students' thinking.

Although there is a decline in students' achievement in higher-order thinking skills, the idea to raise students' level of thinking is not new. It can be traced as far back as 400 years B.C. During that era, Socrates, one of the greatest Greek philosophers and one of the greatest teachers of thinking,

realized that learning was a life-long process; therefore, he taught his students how to formulate thoughts for themselves. Socrates was known for his method of questioning which enabled his students to go beyond opinion, and search out essential meaning. Today, during an "information age", the Socratic method is still being utilized. Like Socrates, some educators mediate by asking questions that motivate children's curiosity and inquiry, and causing them to draw and test their own conclusions (Costa, 1985).

Another master of thinking was John Dewey, an American philosopher. In the 1930's, he wrote a series of papers on the thought process. He is famous for his writing on How We Think (1933). In his book, he stated that the native and unspoiled attitude of childhood, marked by ardent curiosity, fertile imagination, and love of experimental inquiry, is near, very near, to the attitude of the scientific mind. Dewey's work is widely known today in assisting educators to understand the conscious thought of children.

In the 1930's, Jean Piaget, a Swiss psychologist, won international fame for his research into children's thought. Piaget discovered ways that children think and identified many of children's mental abilities and inabilities (Charles, 1974). He built from his observations a theory of human intellectual development. Piaget set the groundwork for educators by describing what children are able to do at each stage of development (Day, 1984). While new research focuses on the actual uses of these capabilities, several models on how to teach thinking are directed by Piaget's work.

Hilda Taba, a noted American educator, culminated a 15-year research project on children's thinking with a social studies program that included certain thinking strategies into the learning process. Taba (1966) claimed that students would not only learn social studies better (Ehrenberg, 1985), but that

they would learn particular thinking skills applicable to any learning or any life situation. Taba identified (certain thinking skills) concepts, principles, attitudes, and skills as basic types of learning objectives of any curriculum. Several school districts are using (Ehrenberg, 1985) Hilda Taba's research to improve the thinking skills of children.

During the 1950's, Benjamin Bloom gained recognition for organizing a hierarchy of cognitive objectives. Bloom and his associates are famous for the publication, Taxonomy of Educational Objectives: Cognitive Domain (1954). The hierarchy of skills defined by Bloom is designed to raise the levels of questions in order to prompt students to think at higher cognitive levels. The six cognitive levels defined by Bloom are knowledge, comprehension, application, analysis, synthesis, and evaluation. This classification system makes it possible to develop school assignments and independent tasks, and at the same time, enables students to practice extending their information into higher and more creative levels of thinking.

The work of J.P. Guilford, known as Guilford's Structure of Intellect (Guilford, 1967), is similar to Bloom's model. Guilford's model consists of six levels also. They are units, classes, relations, systems, transformations, and implications. His model is used widely as a guide in building thinking skills programs.

In an attempt to solve the problems of teaching thinking skills effectively, numerous projects, studies, and models have emerged.

Instrumental Enrichment is a thinking skills program created by Reuven Feuerstein (1979), an Israeli clinical psychologist and an internationally known expert on cognitive development. The goal of the program is to develop thinking and problem-solving abilities in children in order to become autonomous

learners. In developing the theoretical foundation of his work (Hobbs, 1980), Feuerstein had to surpass three intellectual traditions in psychology: psychodynamic theory, behaviorism, and the psychometric movement (Hobbs, 1980). His program was first used with retarded citizens. Feuerstein used his instruments to convey that cognitive levels of retarded learners could be raised. At present the Instrumental Enrichment program is used successfully with students of all cognitive levels.

The Strategic Reasoning model was developed by John Glade and was based on Albert Upton's work. Strategic Reasoning is a cognitive skills program that teaches students fundamental thinking skills, reasoning abilities, and problem-solving techniques (Glade & Citron, 1985). According to Anderson (1983), research evidence concerning the effectiveness of the model is positive.

Edward de Bono, one of the world's leading experts in the field of thought, developed a program called CoRT (Cognitive Research Trust). When successfully implemented, four levels of Achievement in the thought process are acquired and, according to de Bono (1983), children enjoy the program and motivation is high. David Lane (de Bono, 1983), at the Hungerford Guidance Centre in London, found that teaching this program to delinquent and violent youth brought improvement in their behavior. In another study by John Edwards (de Bono, 1983), it was found that when using the CoRT program in lieu of a science syllabus, the students using CoRT did significantly better at thinking than the untrained students. The students using CoRT seemed to do better in science also than the untrained students who were exposed to science materials. De Bono (1983) described his approach for teaching thinking as the "generalizable skill of thinking." His method, also known as "the direct teaching of thinking as a skill", has been used (de Bono, 1983) from the jungles of South

America to the boardrooms of major corporations. De Bono is presently director of the CoRT in Cambridge, England, and of the Edward de Bono School of Thinking in New York, NY.

Utilizing the research of Hilda Taba, Ehrenberg and Ehrenberg (1982) developed an effective thinking skills model called BASICS. The program is intended to improve students' achievement in five important types of learning objectives: attitudes, concepts, facts, principles, and skills. Ehrenberg (1985) found that over the past twelve years many educators have learned and successfully applied the concept-centered ideas taken from BASICS.

A thinking skills program to develop higher-level thinking abilities is the Structure of the Intelligence (SOI) by Mary Meeker. The program, based on Guilford's model, aims to provide children the necessary intellectual skills to master subject matter and critical thinking (Meeker, 1969). The greatest pay-off from utilizing SOI is that it increases academic achievement as measured by standardized achievement tests (Meeker, 1985).

A thinking skills program that seeks to improve students' performance in subject areas by infusing critical thinking instruction into the content area is known as IMPACT (Improving Minimal Proficiencies by Activating Critical Thinking) and was developed by S. Lee Winocur. According to Winocur (1985), IMPACT has three essential features of effective instruction:

1. Skills are clearly identified and placed in a hierarchical sequence of cognitive development.
2. Ten teacher behaviors that promote critical thinking are identified and practiced.
3. Skills are presented in a lesson plan format that infuses critical thinking into the content areas, identifies the

cognitive skill level of the lesson, labels classroom structure to promote critical thinking skills, and includes learning activities.

Project IMPACT has been funded and sponsored by the National Diffusion Network and is used in several states. Its effectiveness is attributed to its clear theoretical base, its clear ease of implementation, and its synthesis of theory and practice (Winocur, 1985).

Project IMPACT carries with it the following assumptions (Winocur, 1985):

1. All students are capable of higher-level thinking.
2. Thinking can be taught.
3. Thinking skills can be learned.
4. Thinking skills are basic to the learning process.
5. Thinking is best introduced in a social context.
6. Thinking skills must be related to the curriculum.

A thinking program designed to teach students to read interpretively by thinking independently and reflectively is the Junior Great Books program by Howard Will. The Junior Great Books program gives children a process of education that will enable them to learn to read interpretively on their own and to realize that other equally valid interpretations may be considered during their discussions (Will, 1984). The Junior Great Books program was developed in the 1960's, and today is used in several countries with over 450,000 youngsters participating in the program (Will, 1984).

A computerized thinking skills program, known as the Higher-Order Thinking Skills (HOTS) program by Stanley Pogrow, is aimed at utilizing the computer to teach higher-ordered thinking skills. The following skills are

stressed (Pogrow, 1985):

1. Developing and testing strategies for the solution of problems.
2. Interpreting computer-generated feedback as to the quality of strategies.
3. Integrating and synthesizing information from a variety of subjects to the solution of problems.
4. Generalizing ideas across content areas and computer environments.

The program is considered outstanding and has been awarded grant funding by former Secretary of Education Terrell Bell (Pogrow, 1985).

When Matthew Lipman created the Philosophy for Children, his primary motives were to encourage children to become excellent thinkers. Lipman (1985) believes that thinking is creative as well as critical, imaginative as well as logical, and inventive as well as analytical; but to make students think well, one must first make them think. The program makes the following assumptions (Lipman, 1985):

1. Children are by nature interested in philosophical issues such as truth, fairness, and personal identity.
2. Children should learn to think for themselves, to explore alternatives to their own points of view, to consider evidence, to make careful distinctions, and to become aware of the objectives of the educational process.

Lipman (1985) noted that a visit to a classroom where Philosophy for Children is being taught competently will reveal the exuberance with which children respond to the opportunity to discuss ideas that matter greatly to them and to think cooperatively in a community of inquiry.

A program called the Future Problem Solving Program, which is based on the work of Alex Osborn and Sidney Parnes, was designed by E. Paul Torrance, an internationally known expert in creativity (Crabbe, 1985). It aims to develop creative problem-solving skills while learning about the future. Crabbe (1985) noted that the Future Problem Solving Program has the following assumptions:

1. Problem-solving skills are necessary to function effectively.
2. In order to prepare for the future, children need to consider issues related to that future.
3. Students can, and should, be taught to think more creatively.

Many school systems find this program effective for gifted students.

Odyssey: A Curriculum for Thinking was developed by a team of researchers from Harvard University, Bolt Beranek and Newman Inc., and the Venezuelan Ministry of Education. The Odyssey materials include six units:

1. Foundations of reasoning
2. Understanding language
3. Verbal reasoning
4. Problem-solving
5. Decision making
6. Inventive thinking

The Odyssey materials were originally developed for use in Venezuela as part of that country's Project Intelligence. A 1981-82 evaluation (Wright, 1985) found that gain made by classes using the experimental materials ranged from 1.15 (Cattell Test) to about 2 (target abilities test) times those achieved by control classes.

Most of the thinking programs that are mentioned in this review of literature use special materials and have had some successful results. However,

Barry Beyer, Professor of Education at George Mason University in Fairfax, Virginia, professes that although these programs are useful, such skills as detecting bias and distinguishing facts from opinion should be taught directly in the classroom (Brandt, 1985). Beyer further adds that the main thing one needs to do is to use what he knows about teaching and to revise the entire curriculum so that one can teach thinking as a part of what he ordinarily does, and not with a lot of external materials (Brandt, 1985). Beyer suggests (1985) a five-step process that is useful to teach any thinking skill:

1. Introduce the skill to be taught.
2. Explain the procedures and rules of which the skill consists.
3. Demonstrate how the skill is used.
4. Have the students apply the skill.
5. Have the students to review and reflect on what occurs as they execute the skill.

Beyer believes if these skills are incorporated into the curriculum and are taught directly step by step, students will become critical thinkers (Brandt, 1985), but Richard Paul, Director of Center for Critical Thinking and Moral Critique at Sonoma State University in Rohnert Park, California disagrees. Paul (1985) contends that critical thinking is more than just a set of technical skills. Teaching critical thinking, Paul argues, requires a dialetical approach and that it must move back and forth between opposing points of view (Brandt, 1985). Dialectical thought is the master-principle of all rational experience and human emancipation; it cultivates the mind and orients the student as no technical training can (Paul, 1985).

There are some who question the theory that thinking actually can be taught. Raymond Nickerson has an answer to the question (Brandt, 1986). He

says that educators can either teach thinking or they cannot teach thinking. Ronald Brandt (1986) adds that if educators believe that they cannot teach thinking and they really cannot teach thinking, then they are wasting time trying to teach thinking. On the other hand, if educators believe that they can teach thinking and they really cannot teach thinking, then it will be frustrating to them, knowing they have done their best. Brandt (1985) further adds that if educators think they cannot teach thinking, but that they really could teach thinking, then they are going to miss one of the greatest opportunities to change education they ever had. Brandt (1986) concludes that if educators think they can teach thinking and they can teach thinking, then they are going to change the future of millions of students.

Finally, there was no question that numerous programs, methods, and models existed in the area of teaching thinking skills. From the literature review, certain notions emerged with suggested strategies and approaches to consider in incorporating higher-order thinking skills into teaching and learning. A common agreement was that adequate training is essential to a successful thinking skills program. Such preparation includes certain areas: assessing the needs of the school and the teachers, inservice education, and effective teaching.

CHAPTER III

ANTICIPATED OUTCOMES AND EVALUATION INSTRUMENTS

Goals and Expectations

The goal of the practicum was to organize and implement a thinking skills program with emphasis on higher-order thinking skills. The program aimed to provide inservice education for teachers, as well as an effective thinking skills program for children. It was anticipated that teachers would develop competencies in the teaching of thinking and that students would improve their efficiencies in higher-order thinking (a prerequisite for all subjects taught in school).

Terminal Performance Objectives

1. At the end of the practicum implementation, at least 80% of the teachers participating in the implementation were expected to:

   1.1 - Demonstrate competencies in teaching thinking as measured by the Teacher's Self-Evaluation Checklist (Appendix B).

   1.2 - Demonstrate positive attitudes toward the thinking skills program as measured by the Participant Evaluation of Staff Development Activity (Appendix C).

   1.3 - Organize a set of thinking skills activities as measured by observational techniques by the coordinator.

   1.4 - Develop effective teaching thinking behaviors as measured by a Classroom Observational Checklist (Appendix D).

2. At the end of the practicum implementation (third grade students):

   2.1 - At least 75% of the students were expected to show improvement on the knowledge level of thinking as measured

by a thinking skills test (Appendix E).

2.2 - At least 70% of the students were expected to show improvement on the comprehension level of thinking as measured by a thinking skills test (Appendix E).

2.3 - At least 60% of the students were expected to show improvement on the application level as measured by a thinking skills test (Appendix E).

2.4 - At least 50% of the students were expected to show improvement on the analysis level of thinking as measured by a thinking skills test (Appendix E).

2.5 - At least 40% of the students were expected to show improvement on the synthesis level of thinking as measured by a thinking skills test (Appendix E).

2.6 - At least 30% of the students were expected to show improvement on the evaluation level of thinking as measured by a thinking skills test (Appendix E).

Mechanism for Recording Unexpected Events

Although it was expected that positive results would be achieved in finding solutions to the problems presented in Chapter II, provisions would be made to deal with the possibility that the ideal would not exist in all situations. Accordingly, in the event that an objective was not successfully evaluated, additional information would be documented in a log maintained by the author. Further, third grade teachers were asked to keep an accurate record to document any unexpected outcome that appeared during the implementation.

Measurement of Objectives

The instruments used to measure the terminal performance objectives for teachers are as follows:

1. The Teacher's Self-Evaluation Checklist on Thinking Skills noted in objective 1.1 is based upon a rating scale of 1-5. It permits the teacher to evaluate the degree of effectiveness of classroom atmosphere and teacher performance with 5 ranking as high and 1 ranking as low. The checklist was used as a pre-evaluation and post-evaluation instrument.
2. The instrument used to measure objective 1.2 (Appendix C) is the Participant Evaluation of the Staff Development Activity Checklist which consists of a 5-point Likert-type scale. Participants were asked to rate the degree to which they agree with 13 activities statements as follows:

   1 - Strongly agree

   2 - Agree

   3 - Undecided

   4 - Disagree

   5 - Strongly disagree

   The Participant Evaluation of Staff Development Activity Checklist was used as a means of evaluating each inservice activity.
3. The thinking skills activities that teachers organized for their classrooms (Objective 1.3) were evaluated through observational techniques by the coordinator using Appendix E as a framework. The coordinator looked for six levels of

thinking activities: knowledge, comprehension, application, analysis, synthesis, and evaluation.

4. The effective teaching thinking behaviors, described in objective 1.4, was also measured by classroom observation. Effective inservice training determined how classrooms were evaluated. After inservice training was initiated on effective teaching thinking behaviors, a local observer was selected to observe teacher effectiveness during classroom presentations and to recommend useful suggestions to individual teachers as needed. The observer utilized the Classroom Observation Checklist (Appendix D). This instrument consisted of a 3-point rating scale. The observer was asked to rate 13 categories of classroom behaviors by giving a rating of: yes, no, or unsure.

The instrument used to measure the terminal performance objectives for the children, Objectives 2.1 - 2.6, was a Thinking Skills Test of a hierarchy of thinking levels. For each cognitive level, four indicators were listed (Appendix E). The instrument was administered to third grade students and was utilized as a pre-evaluation and a post-evaluation.

Description of Plans for Analyzing Results

The evaluation forms were completed at the end of the implementation. Pre-evaluations and post-evaluations were compared. Results were recorded and analyzed. A bar graph and a table were constructed to show improvement in specific areas.

CHAPTER IV

SOLUTION STRATEGY

Discussion and Evaluation of Possible Solutions

A review of literature revealed that the teaching of thinking skills is a current and major issue of concern. Even though there is a wealth of research and materials on the topic, the successful teaching of thinking skills is a neglected area. Moreover, only a few school systems are making the effort to tackle the problem as a collective effort. Literature related to the effectiveness of a thinking skills program suggested a number of possible solutions to the problems inherent in the existing school. Some solutions to the problem were considered, but were not feasible.

A first possible solution was to employ a coordinator to effectively train teachers, to monitor the thinking skills program, to evaluate the success of the program, and to address the incorporation of the program concerns with teacher concerns (Garmston, 1985). In this situation the coordinator could serve as the glue (Glickman, 1985) that links individual teacher needs with organizational needs so that the entire school could work together in harmony toward its perception of what the school should be. This solution was not financially possible.

A second possible solution to the problem was to provide college courses to properly train teachers to teach thinking; this was an inappropriate solution because the school system lacked the funds to offer these courses and besides there are no nearby colleges or universities.

A third possible solution was to incorporate one of the better thinking skills program into the curriculum. An ideal program was Philosophy for Children. Matthew Lipman, who is the author of this program (Brandt, 1985), believes that if a teacher is going to use this program, then she should work for

one full year with a person who has earned a Doctorate in Philosophy in order that she is fully prepared to use the program. Ronald Brandt (1985) observed this to be a difficult requirement; yet many hundreds of thousands of teachers have done just that. He further maintains it is not widespread, but it is amazingly widespread for those kinds of conditions. This solution was educationally appropriate, but it was unsatisfactory due to the timeliness and unavailability of funds.

A fourth possible solution was to bring in several leading experts in the field of thinking to serve as consultants to the staff. The following experts could have provided the following expertise:

1. S. Lee Winocur (1985) could have shown the staff how to effectively develop lesson plans using cognitive objectives.
2. Arthur L. Costa (1985) could have aided the staff in the establishment of a thinking skills program across the disciplines.
3. Barry Beyer (1985) could have elicited practical strategies for the direct teaching of thinking.
4. David N. Perkins (1984) could have added to the program by sharing his insight on creativity by design.
5. Richard Paul (1985) could have been instrumental in involving the staff in an indepth training session on dialectical reasoning.

This solution was ideal; yet, it was impossible due to lack of funds.

Description and Justification for Solution Selected

The solution that was selected involved two main components: a program that included staff development for all teachers and a program that included higher-order thinking skills for third grade children.

Through inservice training for teaching thinking, teachers were awarded

certificates for successfully completing the inservice training. The seven sessions of inservice training were designed to increase teachers' efficiencies and to motivate them to utilize various teaching strategies in order to bring about positive results in the thinking processes of students. During each 90 minute session, participants were given opportunities to make inquiries and to share useful knowledge with other participants. As an added entity, audio-tapes on teaching thinking skills were provided.

The component that involved third grade students consisted of research strategies that enhance higher-order thinking. The strategies drawn from the works of noted experts such as Benjamin Bloom and his colleagues (1954), Mary R. Rowe (1974), Arthur Costa (1981), Barry Beyer (1983), Jean Piaget (1953), Bernice McCarthy (1985), Robert Sternberg (1981), and others were employed. Adding to this component was the Junior Great Books program which assisted children in reading interpretively. The writer served as coordinator for the program and as lead teacher in setting the stage for the other third grade teachers. Once the implementation had begun, it was expected that all teachers would teach for higher-order thinking each day during each lesson whenever appropriate.

It was proposed that the solutions previously mentioned would be successful because of certain attributes they possessed: (1) these solutions were based on research, (2) they were motivating and non-threatened, (3) the teachers felt a need to address the teaching of thinking as an area of needed improvement, (4) the administration of the school supported the program, (5) the program was cost-effective, and (6) the solutions were educationally sound and had a positive chance that teachers would change their teaching behaviors and that children would improve their abilities to think on higher levels.

The following steps toward solving the problem were proposed:

1. Attain permission to implement the practicum from the administration of the school and Nova University.
2. Continue to review the literature on current issues and trends.
3. Utilize a consultant who is abreast on thinking skills research.
4. Conduct pre-evaluation surveys.
5. Offer inservice training to the faculty.
6. Utilize the writer's talents and her students as a model for teaching and learning.
7. Evaluate the effectiveness of each staff development activity by using the evaluation sheet (Appendix C). Noted comments will be included in the plan of action after each staff development activity.
8. Collect/borrow/purchase materials as funds become available.
9. Follow through on thinking activities utilized in the third grade and other grades.
10. Keep an accurate, up-to-date log in order to present a clear, concise practicum report.
11. Secure permission from the Association for Supervision and Curriculum Development to include written documents.
12. Conduct a summative evaluation of the total program.

In order to maintain a time frame, a calendar plan was proposed (Appendix H).

Report of Action Taken

The action taken to implement the solution strategies was in accordance with the plan previously mentioned in this chapter. The timetable of the practicum implementation also followed the original calendar of events (Appendix H).

In keeping with the research emphasis on the importance of teacher involvement in the planning phase, a needs assessment (Appendix A) was administered to the teachers during June workshops prior to the closing of school. Items on the needs assessment instrument identified specific areas of needed improvements that were discussed earlier in Chapter II.

Recruiting teachers into the program was no problem. Near the close of the school year, there was a form of collaboration that set the stage for inservice training. During the collaboration, teachers were made aware of the need to teach thinking more effectively and were briefed on a plan of action to carry out a thinking skills program. Seeing the needs and benefits of the program, each teacher (18) agreed to participate.

In July, efforts were initiated to begin a successful thinking skills program at Mini City School. The selection of the writer as project coordinator was based on her leadership ability, master teacher status, experience, and competence in her field of study, as well as in related areas of study. The coordinator was able to demonstrate positive attitudes towards the teaching of higher-order thinking and to communicate her interest in the teaching of thinking skills to the other teachers, the students, and the public as well.

While the coordinator was responsible for providing top-quality thinking skills strategies for the teachers and the children at Mini City School, she felt that other consultants were needed to give the program added value and enthusiasm.

The coordinator assumed the following leadership roles as inferred by Mechling and Oliver (1983):

1. Conducting surveys to determine the needs of the thinking skills program

2. Discussing thinking skills strategies with teachers and the principal
3. Visiting classrooms when higher-order thinking skills were taught
4. Sharing thinking skills success experiences as models for teachers to emulate
5. Devoting PTA meetings to thinking skills
6. Identifying resources which enhance higher-order thinking
7. Insisting that higher-order thinking be taught for specified amounts of time and infused into total curriculum.

The school principal added to the success of the program as inferred by Mechling and Oliver (1983):

1. Providing a petty-cash fund for the purchase of inexpensive local supplies
2. Anticipating costs related to program selection and teacher attendance at conventions and workshops involving the thinking process
3. Making allowances for cost relating to thinking inservice programs
4. Assisting the coordinator in designing a program to spark new life into teaching higher-order thinking
5. Assisting the coordinator in securing a resource person to present inservice workshops on the teaching of thinking
6. Showing positive support for the total thinking skill program.

During the August workdays prior to the opening of school, efforts were underway to begin the eradication of the ineffectiveness of teaching for

higher-order thinking among the children at Mini City School.

During this planning phase, a letter (Appendix F) was sent to Deborah Johnson, Permission Editor of the Association for Supervision and Curriculum Development, requesting permission to reprint certain materials found in the book, Developing minds (1985), and in the recent issues of Educational Leadership in the final practicum report. The letter was signed by Deborah Johnson and returned along with a copy of the copyright policy (Appendix G). At this time, teachers were administered the Teachers Self-Evaluation Checklist on Thinking Skills (Appendix B). Items on the self-evaluation checklist attempted to determine teachers' levels of teaching thinking skills effectiveness and to elicit their attitudes regarding their classroom teaching behaviors. These checklists were completed and returned to the coordinator. Data from these forms were compiled and used as a pre-assessment component. Teachers were then briefed concerning the practicum problem and the solution strategies proposed in solving the practicum problem. Later, during the month of August, the coordinator was able to secure two local persons who were knowledgeable in the field of teaching thinking. One agreed to serve as thinking skills presenter, and one agreed to serve as classroom observer. This added more spice to the program by helping to keep expenses to a minimum.

The local observer was furnished with several copies of the Classroom Observation Checklist (Appendix D). She was asked to observe each teacher at least twice during the school year. The first observation was completed by the first week in September and the last observation was completed the first week in May. The coordinator recorded the results from the first observation checklist and gave each individual teacher a copy of her classroom rating. Each teacher kept her observational checklist with her daily lesson plans as a

constant reminder to practice using the behaviors that most lent themselves to the enhancement of teaching thinking skills.

During the last week in August, the first inservice training took place. The coordinator was the presenter of this session which centered around The Rationale to Teach Thinking.

First a review of literature was presented and discussed. A copy of the review of literature found in Chapter II was distributed and discussed. As an added component, overhead transparencies were included (Appendices I, J, K, and L).

Along with the review of literature, the coordinator presented significant factors that pointed to the need for teaching thinking (McTighe and Schollenberger, 1985).

1. Characteristics of present and future societies were the first significant factors that pointed to the need for teaching thinking. America has moved from an industrial era into the information age. McTighe and Schollenberger (1985) reported 55% of the nation's workers are engaged in processing and communicating and that the requirements clearly affect educational goals and practices.

   The National Science Board Commission on Pre-College Education in Math, Science, and Technology urged in its report, Educationing Americans for the 21st Century, that our nation must return to the basics, but the basics of the 21st century are not just reading, writing and arithmetic. They include higher problem solving skills, communication, and scientific and technological literacy which are the thinking

tools that permit one to understand the technological world around him. The Education Commission of the States (1982) identified certain skills that are imperative for future existence. (See Appendix I for the transparency used to reiterate these skills.)

2. Student thinking capabilities were the second factors that pointed to the need to teach thinking. Even though there is an urgent need to improve the teaching of thinking skills, the percentage of students achieving higher-order thinking skills is declining (Education Commission of the States, 1982). (For the transparencies utilized to convey this idea, see Appendices J and K.)
3. Today's teaching methods were the third factors that pointed to the need to teach thinking. McTighe and Schollenberger (1985) pointed out that many probing studies indicated that the teaching methods that value thinking are below the norm. John Goodlad's (1984) results (Appendix L) also affirmed that most teachers do not utilize methods that encourage and develop thinking within their children.

At this particular point, the coordinator made it clear that the purpose of this practicum was not to utilize or agree with all the research, methods, and programs discussed in the practicum implementation, but rather to broaden the teachers' horizons in understanding the thought process. In addition, Ronald Brandt (1984) is convinced that in the next ten years every teacher will be expected to understand cognitive processes and know ways to strengthen them.

During the last week of August the audio-tape, Cognitive Development by

Reuven Feuerstein, was presented. In this audio-tape, Feuerstein spoke on Cognitive Development: A Way to the Autoplasticity of Human Existence - Going Beyond the Possible. A brief summary of this audio-tape is as follows:

> Feuerstein's theory concerning the development of autoplasticity in individuals is somewhat a belief system that is not always equated to scientific thought. He described human beings as autoplastic - meaning that they have the possibility to change themselves at will, to modify themselves, and to reach out to directions which they previously did not have in their repertoire of behavior or which do not exist. Modifiability is accessible to individuals irrespective of what has made them function the way they do, irrespective of the age at which the mediator starts to intervene, and irrespective of the severity of their conditions. Mediated learning experience explains human modifiability; it is by virtue of being exposed to mediated learning experience that the individual goes out into the world and sees the world with eyes that permit him to benefit from each stimuli. He observes and this permits him to change, to become more efficient, and more able to cope with the world in a more efficient way. Feuerstein says if the mediator should witness these changes in their capacities to handle the world, they have to first consider the way they have changed themselves and their capacities in the world.
>
> One element of modifiability is a change which the mediator has produced in an individual in a structured way will not stand where the mediator leaves it, but will continue to grow and develop beyond what the mediator has done, beyond the

movement the mediator has imposed. Mediated learning experience is not a different type of interaction. The mediators act in a way which offer a quality to this interaction and they frame this interaction. They organize the stimuli for the child. They do not allow the stimuli to enter when they (stimuli) want to enter and how the stimuli want to enter. The mediator has an intention and his intention changes the stimuli.

There are a number of criteria by which this quality of interaction is best illustrated. One is intentionality and reciprocity. If a mediator has the intention to mediate one particular stimulus, he (mediator) acts in a very different way making sure that the child reciprocates in some manner the mediator intended. This is a very important component of the quality of interaction. Another criterion by which this quality of interaction is best illustrated is mediation of one's self as a changing existence. This is a very important dimension which the mediator offers the child. The mediator is a changing individual. This is expected; mediators are expected to change and develop. The concept of modifiability as an attitudinal phenomenon, which will make an individual accept his changing and he can expect and have the right to expect change, for the better, is of the greatest importance. Another criterion by which this quality of interaction is best illustrated is by mediation of imitated behavior. When one imitates as a function of mediation processes, he does something very different than when he imitates or when he just sees a model for imitation. The child benefits from direct exposure to stimuli.

Without mediated learning experience, the students' level of modifiability will be low, reduced or even non-existent. (This is what Feuerstein calls a culturally deprived individual, not that the culture has deprived the student, because there is no culture that deprives an individual; but rather, the student became deprived of his own culture because he was not given mediated learning experiences. Without mediated learning experiences, the student is forced to live in a world full of direct and active stimuli and the student's benefits are limited). Feuerstein (1986) states that modifiability is a reality and that failure has to be challenged.

Feuerstein emphasized that some children cannot accept mediation that is given and need one of a higher intensity to overcome genetic resistance by making higher levels of amplitude of interaction. His idea of mediated learning experience and its expression in the content-free system of mental exercise began to emerge when he was a student of two great masters of the Genevan School, Jean Piaget and Andre Rey. Feuerstein introduced a determinant of development that was not part of Piaget's theory; he has converted a descriptive system to an instrumental and operational one (Feuerstein, 1979).

The learning potential and assessment device (LPAD), designed by Feuerstein, has a method to assess the capacity to become involved in a process of change and a method that is trying to figure out what are the preferential modalities by which such individuals can undergo the practical change in the practical or more general area.

There were children entering into Feuerstein's program with I.Q.'s as low as 50, but after interventions, were able to proceed into higher levels of mental function that nobody had ever expected. This program was able to show the meaning of the children's capacity and ways in which these changes can best be produced. This program has become a worldwide known and established program for mainstreaming children who were previously considered as belonging to the lowest level of functioning, the less motivated, and the least able to join normal society. Follow-up studies made years after then found these children successful, career people.

Feuerstein's program is not offered to untrained teachers, mainly because it will not benefit the children to do so. The LPAD examiner engages the child in a clinical, teaching, learning exercise which is a test-teach-test, to discover the way the child perceives the world, processes information acquired, and communicates the results. Feuerstein Instructemental Enrichment (FIE) consists of 15 instruments (paper and pencil exercises). Each instrument focuses on a set of deficiencies in the prior learning potential assessment.

Feuerstein (1984) insists that except for the most severe instances of genetic and organic impairment, the human organism is open to modifiability at all ages and stages of development.

After the audio-tape presentation, the coordinator and the teachers reviewed and opened discussions on Feuerstein's theory. Interaction from the teachers led to the belief that the presentation was fruitful.

During the same day teachers were given some tips on starting a thinking skills file. They were asked to save all hand-outs and other materials on thinking that they came across and to keep them handy for future references.

At the end of the month, teachers were asked to rate the effectiveness of the inservice training. The results of the evaluative instrument were positive.

On September 3, all third grade students were administered the pre-evaluation assessment. The administrators of the test gave each child a copy of the story; however, the administrators read the story aloud to the students and the questions were read to the students. The administrators gave no hints or answered any questions concerning the test. The students were given 35 minutes to complete the test. The same process was followed for the post-assessment in order to get fair results on both assessments.

During the week that followed, the second inservice workshop, Developing Strategies to Promote Higher-Order Thinking was presented by the local presenter. She thoroughly explained Bloom's cognitive categories (Appendix M) and indicated the levels of behavior students are expected to perform as the objective or goal of specific learning tasks (Presseisen, 1985):

1. **Knowledge level:** Define, recognize, recall, identify, label, understand, examine, show, collect.
2. **Comprehension level:** Translate, interpret, explain, describe, summarize, extrapolate.
3. **Application level:** Apply, solve, experiment, show, predict.
4. **Analysis level:** Connect, relate, differentiate, classify, arrange, check, group, distinguish, organize, categorize, detect, compare, infer.

5. **Synthesis level:** Produce, propose, design, plan, combine, formulate, compose, hypothesize, construct.

6. **Evaluation level:** Appraise, judge, criticize, decide.

The presenter then had each teacher design questions for the story, The Three Little Pigs, using Bloom's Taxonomy. After making certain that each person understood this process, the presenter moved into the last phase of her presentation.

The last phase of the inservice session included a presentation of teaching behaviors that enhances higher-order thinking levels among children:

1. Teachers' questioning techniques that encourage thinking. From questions and other statements that the teacher poses, students derive their cues for expected behavior meaning that questions are the intellectual tools by which teachers most often elicit the desired behavior of their students (Corta, 1985). Because questioning is so critical, special attention was given to this concept. Questioning consisted of training the teachers to develop questioning techniques that were motivating, interesting, and stimulating in order to encourage children to make their own discoveries. It was suggested that teachers think seriously about their questions before asking them, and after the question is asked, the teacher should wait ten seconds before responding, reacting, or asking another. Mary B. Rowe (1974) found observable differences in classroom behaviors of students whose teachers waited after asking a question or after a student gave the answer. When students answer questions, the teacher may find it productive to ask the students to clarify the answer by having them explain how they arrived at the answer or

share the rationale behind it; the teacher causes the student to metacogitate (Costa, 1985).

2. Teacher modeling. The presenter illustrated several modeling behaviors as suggested by Costa (1985).

   - Teachers should listen to students
   - Teachers should be problem-solvers
   - Teachers should react calmly and patiently during stressful situations
   - Teachers should understand others' values, differences and points of view
   - Teachers should become enthusiastic about challenges, puzzles, and complex tasks requiring thought (Rosenshine, 1970).

At the end of the presentation, the coordinator reviewed the teaching behaviors listed in Appendix D noting that this was an opportune time to do so. Certain noted behaviors were illustrated (Winocur, 1985):

- Teacher probes for correct responses.
- Teacher seeks evidence for stated claims.
- Teacher frequently asks, "Why do you think so?"
- Teacher accepts all valid student responses.
- Teacher elicits encouraging, supporting comments to incorrect responses.
- Teacher acknowledge student comments with a nod or other signal.
- Teacher establishes expectation for divergent solutions.
- Teacher asks students to justify and explain their thoughts.
- Teacher raises "if/then" language.
- Teacher poses "what if" or "suppose that" questions.

- Teacher uses examples to facilitate logical thought.
- Teacher poses questions at different levels of Bloom's Taxonomy.
- Teacher allows at least ten seconds of "wait time" for students to answer before restating or redirecting the question.
- Teacher probes "I don't know responses."
- Teacher asks students to clarify and justify their responses.
- Teacher cues students for most logical answers.
- Teacher encourages transfer at end of lesson with comments like, "This will help you in your everyday life in the way . . . "

At end of the session, teachers evaluated the effectiveness of the inservice training (Appendix C). The results were positive. Comments on the staff development evaluation instrument included such remarks as: "Very informative", "I really learned a lot!", "I needed this workshop; I think I can do a better job teaching after today.", "I enjoyed it."

For assignment and as a classroom management tool, teachers were asked to start organizing the thinking skills system using Bloom's Taxonomy. They were to elicit indicators (verbs) listed by the presenter for each classification. Teachers were asked to take a reading story and to formulate two questions from each (6) cognitive levels (12 questions). Teachers were told to mix the levels of difficulty in order that the students' attention spans were kept at the maximum. The teachers thought this was a helpful suggestion, and expressed their desire to do so.

After a week, all teachers had completed the assignment. The coordinator aided teachers who seeked help. In fact, all teachers were able to develop the assignment independently. The coordinator then asked each teacher to develop a teaching lesson using levels of questioning and to pay close

attention to the teaching behaviors listed in Appendix D. The coordinator stressed how this process related to teaching effectiveness and how it could have a positive bearing on the principal's evaluation. Teachers seeing the relationship of what the coordinator had said showed a sense of pride in undertaking the tasks.

During mid-September the third grade teachers were introduced to Junior Great Books program which gives students a process of education that will enable them to read interpretively on their own and to realize that other equally valid interpretation may be heard during their discussions (Will, 1984). Prior to this intervention, teachers were given an opportunity to read the article, You Must Think If You Wish to Read Interpretively by Howard Will in the March/April, 1984 edition of Childhood Education. The goal of the Junior Great Books program is to offer children a method for a lifetime of purposeful reading (Will, 1984). It reaches this objective in three ways, according to Will (1984): by readings included in the program, by the method of discussion, and by a course on interpretive reading and discussion which is included in each volume of its Junior series. After having two successful inservice training sessions and reading the article on the Junior Great Books program, the third grade teachers appeared quite competent to tackle this program with ease. Each teacher taught the Junior Great Books program for one hour each week. This program had three main purposes: 1) as a review for leaders (teachers) on how they may carry out each session with the youngsters, 2) as an aid in preparing good questions for discussion, and 3) as a way of helping students read selections more carefully and get more involved in the discussion (Will, 1984).

The remainder of the month was spent aiding teachers whenever possible. At this time of the year teachers seemed overly busy trying to get to know

their students and trying to get adjusted; therefore, very little information was gathered on teacher feedback. The coordinator felt that teachers needed time to utilize the strategies that they had previously received during the past two months before approaching them for feedback. Nevertheless, it was made clear to the teachers that feedback from them would be welcomed at any time.

During the first week in October the coordinator started focusing her attention on teachers' concerns in reference to the previous inservice training activities. She noted that teachers were highly motivated to carry out the strategies that were presented through inservice training sessions, but from their conversations it was evident that some teachers were attempting to teach higher-order thinking without paying the proper attention to lower-order thinking skills.

During the second week in October the third inservice training, Ways to Improve Student Thinking, took place. This session first focused on problems that teachers were experiencing with the teaching of higher-order thinking skills. The coordinator used a transparency (Appendix N) to stress ways to improve students' thinking (Costa, 1985).

1. Ensure that students process information.
2. Ask broad, open questions.
3. Wait before calling on students.
4. Follow-up on students responses by asking, clarification, elaboration, evidence, and thinking process.
5. Have a clear purpose; plan a sequence of activities to accomplish it.
6. Make students conscious of their own thinking processes.
7. Model problem solving and other thinking processes.
8. Have students ask questions of their own.

After the transparency presentation, the coordinator reminded teachers to make certain that students are equipped with an appropriate background (knowledge, understanding, and experience) in order to tackle a higher-order thinking skill. (If a teacher wants a child to compare a drill with an eggbeater, then she should make sure that the child knows what an eggbeater and a drill are.) The coordinator further added that teachers must remain calm if students do not answer questions readily. The teacher should keep clarifying the question in order that the child responds appropriately.

The remaining of the inservice training included demonstration teaching for higher-order thinking. The local observer demonstrated a teaching lesson on "leaves" using second and third grade students as props. At this point, teachers were given the Classroom Observation Checklist (Appendix D) and were asked to check the appropriate column for each classroom behavior observed during the demonstration.

After the teaching demonstration, teachers compared and discussed the data on the observational checklists. In several cases, teachers were able to give suggestions as to how the lesson could have been more effective. The teaching demonstration was beneficial in that it gave teachers a firsthand experience and it removed some of the apprehension that existed among the teachers.

At the close of the inservice session, teachers evaluated the workshop for effectiveness; the results were positive.

As funds became available, the coordinator and another teacher were sent to a conference sponsored by the North Carolina Association for the Education of the Young Children (NYAEYC). They attended a session on the 4Mat Model - Learning Styles. (This model will be discussed later in the practicum report).

The third grade teachers expressed pleasure at using the Junior Great Books activities. They had developed some higher-order questions on their own that they shared among themselves.

During the month of November, no workshop took place in order to informally observe teachers for teaching effectiveness of higher-order thinking skills. There were two problems that manifested themselves through these observations: teachers needed to extend their orders of questioning and they needed to further clarify some of their questions in order to get better responses from the students. The coordinator and individual teachers discussed ways to improve these areas. The coordinator contributed these problems mainly to lack of teacher experience in these areas and felt that as teachers became more competent in these areas the problems would decrease.

Teachers continued to develop their thinking skills file. They had filed all hand-outs and other materials that they had been able to find. Each teacher had also developed a set of questions using Bloom's taxonomy for reading, science and social studies. The materials although limited were impressive.

During the second week in December the fourth inservice training, Enhancing the Metacognitive Processes was presented by the coordinator. A brief summary follows:

Metacognition refers to one's awareness of his or her own thinking. Costa (1984) defines metacognition as one's ability to plan a strategy for producing what information is needed, to be conscious of one's own steps and strategies during problem solving, and to reflect and evaluate the productivity of his own thinking. Bondy (1984) proposed that metacognitive abilities of self-regulation, self-control and self-direction are critical to the success of the future.

According to Presseisen (1985), metacognition has two main dimensions.

The first is task-oriented and the second is strategic. (See Appendix O for transparency presentation.)

Monitoring task performance requires the following (Presseisen, 1985):

1. Keeping place, sequence
2. Detecting and correcting errors
3. Pacing of work

Selecting and understanding the appropriate strategy require the following skills:

1. Focusing attention on what is needed
2. Relating what is known to material to be learned
3. Testing the correctness of a strategy

Bondy (1984) listed several strategies that promote awareness of metacognitive activity:

1. Have students keep a daily "learning log."
2. Demonstrate and discuss appropriate metacognitive activity.
3. Provide opportunities for feedback.
4. Provide instruction in self-questioning techniques.
5. Teach students to summarize material.
6. Teach students to rate their comprehension.
7. Adapt a learning model.
8. Adapt a studying model.

Costa (1984) claims that teachers can determine if students are becoming more aware of their own thinking as they are able to describe what goes on in their heads when they are thinking. Students should be able to list the steps and tell where they are in the sequence of a problem solving strategy; they should be able to trace the pathways and dead ends they took on the road to a

problem solution. They can describe what data are lacking and their strategies for producing those data.

Not only do students need to be able to think (Bondy, 1984), but they need to exercise control over their own thinking. Metacognition is an indicator (Costa, 1984, p. 62) of the "educated intellect" and must be included in the curriculum if thinking is to become a durable reality for the 1990's and beyond.

At the end of the presentation teachers were given the opportunity to discuss and ask questions concerning the metacognitive process. Then, they evaluated the inservice training for its effectiveness. The results were favorable. On the section for comments, several teachers noted that this was their first introduction to the term metacognition and they had benefited from the training.

At the next faculty meeting the coordinator gave an audio-tape presentation, Classroom Conditions that Encourage Student Thinking, by Arthur Costa. Costa illicited the following criteria in order to promote classroom conditions that encourage intelligent behavior (Costa, 1981; Costa, 1984).

1. Students realize that intelligent behavior is an objective.
2. The teacher's language invites intelligent behavior.
3. Instructional activities are arranged sequentially.
4. Teachers' responsive behaviors enhance and extend students' intelligent behavior
5. The material of instruction support intelligent behavior.
6. Adequate instructional time is devoted to developing thinking.
7. Instruction provides for differences in modality strengths.
8. Modalities are sequenced according to developmental theory.

9. Students and teachers discuss their thinking.

10. Evaluation practices assess intelligent behavior.

11. The teacher models intelligent behavior.

Costa (1981) suggested the following examples of abstract teacher behaviors to be consistent with successful intellectual functioning:

- Being sensitive to subtle clues in student behaviors
- Planning for instruction
- Considering alternative teaching strategies
- Using information and expertise as guidelines for beliefs and judgements rather than using power, rewards, and punishment
- Taking a student's point of view
- Using reason and patience in dealing with discipline problems

Teachers were encouraged to consider the criteria offered by Costa and to relate them in their experiences (Costa, 1984), explore their meanings and consequences, and apply and evaluate them in their own situations.

During mid-December, the third grade teachers met to discuss the progress made by utilizing the Junior Great Books program and to discuss progress made by utilizing higher-order thinking in the instructional program. The teachers expressed positive attitudes toward the program and also shared some of the activities they had tried. As a means of improving their thinking skills instruction, each teacher observed a third grade classroom during a time when the class was involved in higher-order thinking instruction.

During the last two weeks before the Christmas holidays, the coordinator made personal contact with each teacher to see how the program was advancing. She observed that the teachers were adding materials to their thinking skills files and there was clear evidence that teachers were

appreciative of the ideas stemming from the program.

During the second week in January, the fifth inservice workshop, Characteristics of Good Thinkers, was presented by the coordinator. She emphasized the following points in her presentation as based on the work of Baron (1985):

1. Thinking originates with a state of doubt about what to do or believe.
2. One usually has a goal in mind when the doubt arises, but he may search for new goals, subgoals, or a reformulation of the original goal.
3. One searches for possibilities.
4. One searches for evidence relative to the possibilities.
5. One uses the evidences to revise the strengths of the possibilities.
6. One decides that the goal is reached and concludes the search.

There were nine types of thinking presented (Glatthorn and Baron, 1985):

1. Diagnosis is troubleshooting, for which one uses his hypotheses about the source of the problem.
2. Hypothesis testing is the process of forming and testing theories
3. Reflection is the search for general principles or rules based on evidence gathered mostly by memory.
4. Insight is the "eureka" phenomenon.
5. Artistic creation is also an important type of conscious thinking.
6. Prediction is similar to reflection but the search for goals may be controllable.
7. Decision making is a type of thinking in which the possibilities are a course of action or a plan.
8. Behavioral learning involves learning about the effect of one's

conduct.

9. Learning from observation includes all cases in which one learns about the environment through observation alone.

The good thinker (Glatthorn and Baron, 1985):

- Welcomes problematic situations and is tolerant of ambiguity.
- Is sufficiently self-critical; looks for alternate possibilities and goals; seeks evidence on both sides.
- Is reflective and deliberative; searches extensively when appropriate.
- Believes in value of rationality and that thinking can be effective.

The educator's goal is to foster the development of the "good thinker" attributes while helping students understand the limitations of contrary dispositions and behaviors according to Glatthorn and Baron (1985).

Following the presentation, time was set aside for questions and comments. From the questions and comments, one could readily notice that teachers were beginning to understand the cognitive process in a more in-depth prospective. Evaluation results were affirmative.

As the month progressed, teachers had the opportunity to observe peer-teaching by a method established on each grade level. Teachers used the observation checklists to observe certain teaching thinking behaviors during the observation (Appendix D). After the observations, teachers met on grade level to discuss areas of "strengths" and "needed improvements." This method of feedback was not discussed in open sessions. It was felt teachers would benefit more by keeping the privacy of the observational data to a minimum.

At the end of January, teachers seemed to have enjoyed the program. They reported they were becoming more efficient in developing and using higher-order thinking questions. They also stated that the children were more

responsive when they engaged in higher-order thinking.

The third grade teachers also stated that they found the Junior Great Books program was very helpful in developing interpretive skills and that more children were sharing in the inquiry process.

During the last week in January, the coordinator went to San Francisco to attend a two-day institute initiated by Bernice McCarthy. The institute, entitled Learning and Teaching Styles, dealt with four types of learners.

Shortly after the coordinator returned to school from San Francisco, the sixth inservice training was presented jointly by her and the teacher who attended the fall NCAEYC Conference on the 4Mat System. The presentation, Bernice McCarthy's 4Mat System viewed teaching to learning styles with right/left mode techniques.

McCarthy (1981) describes the 4Mat System as an eight-step cycle of instruction that capitalizes on the student's learning style and brain dominance processing strengths and is a method to organize how one teaches, based on research in education, neuroscience, neuropsychology, behavior science, organizational psychology, the fine arts, and creativity (McCarthy, 1985). McCarthy's model, developed in 1980, takes children through four distinct learning styles while using alternating right and left mode techniques. Furthermore, McCarthy's (1985) model is a teaching technology that gives all students a chance to shine and enabling them to reach other proficiencies in other learning styles. The 4Mat System is based on David Kolb's mode. McCarthy used Kolb's model to form a quadrant system for four different learning styles (McCarthy, 1985):

1. Type One Learners are innovative. They learn best through a combination of feeling and watching. They are primarily interested in

personal meaning. Their favorite question is Why? Teachers need to give them a reason.

2. Type Two Learners are analytical. They learn best through a combination of watching and thinking through concepts. They are primarily interested in fact. They experience conceptual understanding. Their favorite question is What? Teachers need to give them facts to strengthen their understanding.
3. Type Three Learners use common sense. They prefer to learn by thinking through concepts and figuring things out for themselves. They are primarily interested in procedures. Their favorite question is How? Teachers need to let them try things.
4. Type Four Learners are dynamic. They prefer to learn by doing things and sensing concrete reality. They are primarily interested in self-discovery. Their favorite question is If? Teachers need to let them teach themselves and others.

McCarthy's model (1985) suggests that all students need to be taught using all four ways so that the student may be comfortable and successful part of the time while being coached to develop learning abilities.

The 4Mat System, a cycle of learning, has other premises (McCarthy, 1986, p. 16):

- The 4Mat system moves through the learning cycle in sequence, teaching in four modes and incorporating the four combinations of characteristics.
- Each of the four learning modes needs to be taught with both right and left brain processing techniques.
- The right mode dominant student will be comfortable half of the time,

and will learn to adapt the other half of the time. The left mode dominant student will do likewise.

- The development and integration of all four modes of learning and the development and integration of both right and left brain processing skills should be a major goal of education.
- Students will come to accept their strengths and learn to capitalize on them while developing a healthy respect for the uniqueness of others, and furthering their ability to learn in alternative modes without the pressure of "being wrong."
- The more comfortable one is about who he is the more freely he learns from others.

Samples of charts, figures, and 4Mat lesson plans were illustrated. They were very useful to teachers. (These materials are not listed in the Appendices of the practicum because of copyright restrictions, however they can be purchased from the publishing company at a low cost.) The teachers liked the ideas so well that they were allowed to purchase McCarthy's materials.

The evaluation results yielded affirmative outcomes for the 4Mat inservice. Teachers commended the two teachers for their presentation and expressed their appreciation to the teachers attending conferences and bringing back such worthwhile techniques and research.

At the end of the inservice, the coordinator gave each teacher an opportunity to discuss problems they had experienced or ideas they had developed thus far in the program. The main problem at this point was not having enough time to really formulate an effective thinking skills file. After hearing several ideas, it was agreed that each teacher was doing a better than adequate job and as they develop and add to their files, they (files) would

gradually become more effective.

The third grade teachers shared their expertise with the Junior Great Books program at this meeting and also explained their thinking skills networking to the teachers. From interaction with the teachers one could notice that other teachers had been sharing ideas on teaching higher-order thinking, but the third grade teachers did have a more in-depth plan.

The month of February was a short school month. School was closed for ten days due to heavy snow, but during the time the students were in school, the thinking skills program continued to succeed.

During the first week in March, the seventh inservice training, Products of Inquiry, was presented by the coordinator. A summary follows:

The presentation of inquiry required that children seek information about a problem or condition involving fourteen process skills (North Carolina State Department of Public Instruction, 1985):

1. Observing involves using one or more of the senses in perceiving properties or similarities and differences in objects and events. Observations are made directly with the senses or indirectly through the use of simple or complex instruments. Observations are influenced by the previous experience of the observer.
2. Classifying involves the sorting or ordering of objects according to their properties or similarities and differences. Classification is based on observational relationships which existed between objects or events.
3. Using space/time relations means describing the spatial relationships of objects and their change with time. Examples of this process skill are motion, direction, and spatial arrangement, symmetry, and

shapes.

4. Using numbers is a means of quantifying measurements or comparisons. Numbers are needed to manipulate measurements, to order, and classify objects.
5. Communicating involves the transmission of observable data. Examples of communication media are spoken or written words, graphs, drawings, diagrams, maps, and mathematical equation. Such skills as asking questions, discussing, explaining, reporting, and outlining aid the development of communication skills.
6. Measuring is the ordering of things by magnitude such as area, length, volume, and mass. Measuring helps quantify observations. The process involves the use of instruments and the skills needed to effectively use them.
7. Inferring involves the use of logic to make conclusions from observations. Inferring suggests explanations, reasons, or cause for events. Inferences are based on judgements and are not always valid.
8. Predicting involves suggesting what would occur in the future. Predictions are based on observations, measurements, and inferences about relationships between or among observed variables. Prediction is speculation of what will happen based on past experiences. Accuracy of prediction is closely affected by the accuracy of the observation.
9. Interpreting data is complex skills involving many other process skills. They involve making predictions, inferences, and hypotheses from a set of data. Interpretations may need revision when

additional data are obtained.

10. Controlling variables involves the management of the conditions or factors in an experiment. Unless the variables of an experiment can be carefully regulated, the results of the experiment are not reliable.

11. Defining operationally involves stating definitions in working terms. Such definitions limit the meaning of a term to "what is done" and "what is observed." Example of a working definition is: A dry cell, when properly connected with two wires and a light bulb, will cause the bulb to glow.

12. Formulating hypotheses involves forming a generalization question based on observations. The hypothesis is a problem to be solved through using other process skills, especially experimenting. Questions, inferences, and predictions could lead to the formation of a hypothesis. The hypothesis has to be tested if its credibility is to be established.

13. Experimenting involves testing a hypothesis under controlled conditions in which variables are limited. Experimenting is basic to the total scientific process and uses all of the other process skills.

14. Formulating models is a useful way of describing and explaining interrelationships of ideas. A model may be a mental, physical, or verbal representation of an idea. Models represent what one knows about an idea or concept and are constantly changing as new data were obtained.

A classroom that promotes thinking is also one where inquiry is shared. The teacher must emphasize inquiry across the curriculum and not just during

science activities: He must use various strategies, skills, and attitudes appropriate to promote the processes of inquiry in the classroom.

During the session, teachers had hands-on experience with each of the 14 process skills.

The evaluation results for the inquiry inservice was positive. Teachers enjoyed the different activities using the hands-on approach.

The third grade teachers continued to work with the Junior Great Books program and the higher-order thinking skills activities. No problems were noted.

During the last week in March, peer observation took place. In determining the observational method, names of each individual teacher were typed on a separate strip of paper and were placed in a box with each teacher drawing a name from the box. The name the teacher drew signified the teacher to be observed. This was a healthy and fun experience. After the observation, the teacher/observer had a post-conference with the teacher observed. Teachers were able to take the data coming from the teacher/observer and utilize it in a most constructive manner. Even though the data was not discussed, the teachers mentioned that they enjoyed this form of peer observation.

At the end of the month, all teachers had added more higher-order thinking skills sheets to their files. The coordinator suggested that they might want to start thinking in terms of formulating higher-order thinking skills for units of work.

Teachers were urged to bridge the gap between traditional instructional design, which originates in behavioral science, and the new designs of cognitive psychology (Winocur, 1985). The instructional design show includes the use of frames to introduce, model, reinforce, transfer, and evaluate the thinking process (Hunter, 1983) during any of the four stages of the learning experience:

orientation, instruction, practice, and transfer (Winocur, 1985).

The teachers brought their thinking skills files to the session for display. It was amazing to see how much effort that had gone into the projects. Each teacher was not able to see each file; therefore, the coordinator asked each teacher to bring her file box back at the thinking skills party in May (and they did).

The teachers reported that they were moving along with the higher-order thinking skills program and that it had strengthened their professional evaluation by the principal. The third grade teachers reported that they had nearly completed the Junior Great Books program and expressed regrets because there would not be an extension of the program.

During the first two weeks in April, teachers continued to work on the strategies presented in the inservice training. The thinking skill program not only helped teachers improve their teaching effectiveness, but it helped boost the teachers morale by (1) satisfying their needs to participate, express their feelings, and receive recognition, (2) manifesting the qualities of determination, confidence, and enthusiasm, and (3) feeling that they were moving in a direction where they also could learn and grow.

Later on during the month, a brief wrap-up session was held for the purpose of sharing experiences and tying up loose ends and was not consedered a complete session. At this session teachers agreed that in order to successfully teach thinking one must assume (Winocur, 1985):

- All students are capable of higher-level thinking.
- Thinking skills can be taught.
- Thinking skills can be learned.
- Thinking skills are basic to the learning process.

- Thinking is best introduced in a social context.

During the first of May, the local observer completed her final observation. After the observations were completed, she returned a completed classroom observation checklist (Appendix D) for each teacher to the coordinator.

During the second week in May, the third grade students had completed the Junior Great Books program and were administered the Post-Thinking Skills Test (Appendix E). The third grade teachers were briefed again on the procedures in administering the test. The procedures were exactly the same procedures used to administer the pre-test.

During the third week in May a thinking skills party was held in honor of the participating teachers. Refreshments were served and teachers had to guess what ingredients were included in the refreshments. The third grade teachers selected certain thinking skills activities from the book, Puzzle Thinking by Franette Walberg (1980). Teachers were awarded tokens (file folders, magic markers, etc.) for correctly solving the puzzle or problem.

At the end of the party (attended by all 18 teachers), the coordinator commended the teachers for their hard work and outstanding cooperation in helping to carry out a successful thinking skills program at Mini City School. She then reviewed the goals of the higher-order thinking skills program, and clarified instruction for completing the Teachers Self-Evaluation Checklist (Appendix B). After the evaluation was completed the coordinator awarded each teacher a certificate of the completion of at least ten hours of instruction in the thinking skills program (Appendix P).

That same day the teachers gave the coordinator permission to keep their files for a week in order to further evaluate the effectiveness of the higher-

order thinking skills program.

After the evaluation, teachers expressed gratitude to the coordinator for organizing a meaningful program in teaching thinking skills. In replying, the coordinator explained that she had learned along with the teachers as she organized and managed the program and then closed the session by saying, "EUREKA!"

CHAPTER V

RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

Results

As previously stated in Chapter Three, this practicum was designed to organize and implement a thinking skills program with emphasis on higher-order thinking skills. It was anticipated that teachers would develop competencies in the teaching of thinking and that students would improve their efficiencies in higher-order thinking. More precisely, at the end of the practicum implementation, at least 80% of the teachers were expected to demonstrate certain thinking skills behaviors. Concurrently, at least 75% of the students were expected to show improvement on the knowledge level of Bloom's Taxonomy and as the levels of thinking became more complex, it was expected that the percentage of children showing improvement in these cognitive levels of thinking would decrease.

In accomplishing the practicum goal, four terminal performance objectives were established for the teachers and six terminal performance objectives were established for the students. The objectives for teachers were:

Objective 1.1: At least 80% of the teachers were expected to demonstrate competencies in teaching thinking as measured by the Teacher's Self-Evaluation Checklist (Appendix B). This instrument, which permitted the 18 teachers to evaluate teachers' effectiveness, was used for both pre-evaluation and post-evaluation.

An analysis of the results of the pre-evaluation revealed that 2 out of 18 teachers or 11% demonstrated competencies in teaching thinking, while the remaining 16 teachers or 89% demonstrated ineffectiveness in teaching thinking.

An analysis of the results of the post-evaluation revealed that all 18 teachers or 100% demonstrated teaching competencies in teaching thinking.

The competencies in teaching thinking were operationally defined as checking "5", "4", and "3" categories as to frequency of performance of listed tasks. Ineffectiveness of teaching thinking was operationally defined as checking the "2" and "1" categories as to frequency of performance of listed tasks.

A comparison of the results of the pre-evaluation and the post-evaluation is shown in Figure 1.

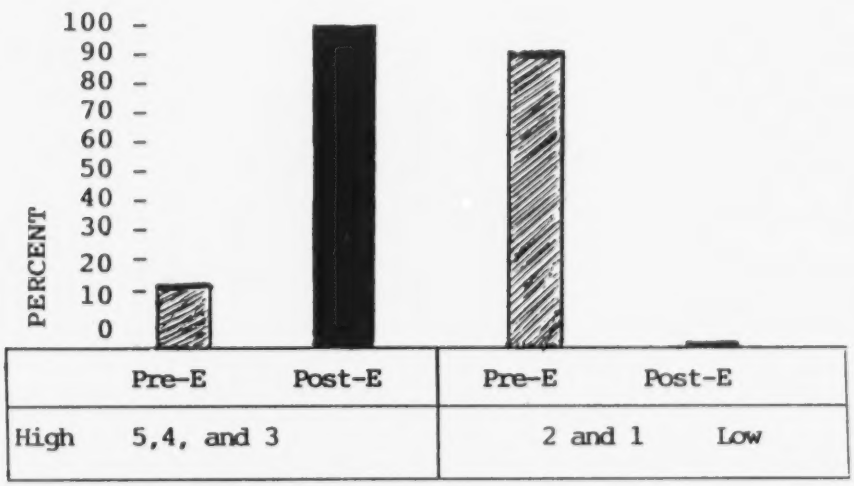


Figure 1. Teachers' Pre- and Post-Self-Evaluation Results.

It was projected in Terminal Performance Objective 1.1 that 80% of the teachers were expected to demonstrate competencies in teaching thinking. This objective was achieved.

Objective 1.2: At least 80% of the teachers were expected to demonstrate positive attitudes toward the thinking skills program as measured by the Participant Evaluation of Staff Development Activity (Appendix C).

At the end of each staff development activity, the teachers were given a

participation evaluation form (Appendix C) which was used to measure the second Terminal Performance Objective for teachers. After each session, data were compiled and teacher percentages were derived.

The data revealed that after each of the seven sessions was completed all 18 teachers or 100% had developed positive attitudes toward thinking skills programs as indicated by either "Strongly Agreeing" or "Agreeing" with all 13 staff development activities as listed on the evaluation form. Specific percentages were as follows: (1) First Session - 94% strongly agreed and 6% agreed; (2) Second Session - 97% strongly agreed and 3% agreed; (3) Third Session - 89% strongly agreed and 11% agreed; (4) Fourth Session - 97% strongly agreed and 3% agreed; (5) Fifth Session - 94% strongly agreed and 6% agreed; (6) Sixth Session - 94% strongly agreed and 6% agreed; and, (7) Seventh Session - 100% strongly agreed.

The mean score for those "strongly agreeing" was 95% and 5% for those "agreeing."

It had been projected in Terminal Performance Objective 1.2 that 80% of the teachers would develop positive attitudes toward the thinking skills program. This objective was achieved with 100% of the teachers developing positive attitudes toward the thinking skills program. Further evidence was provided by the positive responses of teachers during the implementation phase.

Objective 1.3: At least 80% of the teachers were expected to organize a set of thinking skills activities as measured by observational techniques.

This objective was met with all 18 teachers organizing a starter set of thinking skills activities. Before the implementation, observational methods revealed that no teachers had any organized thinking skills system. Yet after the implementation, observational techniques revealed that each teacher had

developed at least twelve activities using Bloom's levels of cognition. There was also sufficient evidence of research articles, and other types of thinking skills as well. There was no definite system for how to best file the thinking skills. Because each teacher had her own management system, teachers were allowed creativity in the filing phase. The coordinator observed this component for contents and for the teacher's personal strategies of filing them.

It was projected in the Terminal Performance Objective 1.3 that at least 80% of the teachers would organize a set of thinking activities. The objective was achieved with 100% of the teachers organizing thinking skills activities.

Objective 1.4: At least 80% of the teachers were expected to develop effective teaching thinking skills behaviors (Appendix D).

The local observer was asked to carefully observe each teacher twice during the year - once at the beginning of the school year and once near the end of the school year in order to observe for effective teaching thinking skills behaviors.

The analysis of the data revealed that of the 18 teachers involved in the implementaion, 100% developed effective teaching thinking skills behaviors. The mean score for the pre-evaluation of the number of teaching thinking skills behaviors mastered was 8.9 while the mean of the post-evaluation of the numbers of teaching thinking skills behaviors mastered was 14.6. A mean gain of 6 teaching thinking skills behaviors was thus obtained.

A comparison of the pre-evaluation and post-evaluation result in shown in Table 1.

At the beginning of the practicum implementation, it was projected that 80% of the teachers were expected to develop effective teaching thinking skills behaviors. This objective was achieved.

Table 1

Teachers Achieving Mastery of Teaching

Thinking Skills Behaviors

Teacher No.	Pre-Evaluation No. of Mastery	Post-Evaluation No. of Mastery	Difference*
1	7	15	8
2	11	15	4
3	6	14	8
4	6	15	9
5	8	15	7
6	7	15	8
7	9	14	5
8	11	15	4
10	9	14	5
11	7	12	5
12	13	15	2
13	5	13	8
14	9	15	6
15	12	15	3
16	8	15	7
17	10	15	5
18	11	15	4
mean	8.9	14.6	+6

*Positive (Gain)

There was a total of 78 third grade children evaluated during the course of the practicum implementation. Each child's pre-test (Appendix E) was compared to his post-test (Appendix E) with respect to Bloom's Taxonomy and a consolidated class evaluation for both the pre-tests and post-tests was completed. Although there were six terminal performance objectives for the students, a comparison of the pre-evaluation and post-evaluation results is shown collectively in Table 2.

Objective 2.1: At least 75% of the students were expected to show improvement on the knowledge level of thinking (Appendix E).

An analysis of the results revealed that 92% of the students showed improvement on the knowledge level and a gain of 23%. The projection for Objective 2.1 was achieved (Table 2).

Objective 2.2: At least 70% of the students were expected to show improvement on the comprehension level of thinking (Appendix E).

An analysis of the results revealed that 88% of the students showed improvement on the comprehension level and a gain of 20%. The projection for Objective 2.2 was achieved (Table 2).

Objective 2.3: At least 60% of the students were expected to show improvement on the application level (Appendix E).

An analysis of the results revealed that 85% of the students showed improvement on the application level and a gain of 44%. The projection for Objective 2.3 was achieved (Table 2).

Objective 2.4: At least 50% of the students were expected to show improvement on the analysis level (Appendix E).

An analysis of the results revealed that 68% of the students showed improvement on the analysis level and a gain of 35%. The projection for

Objective 2.4 was achieved (Table 2).

Objective 2.5: At least 40% of the students were expected to show improvement on the synthesis level of thinking (Appendix E).

An analysis of the results revealed that 57% of the students showed improvement on the synthesis level and a gain of 26%. The projection for Objective 2.5 was obtained (Table 2).

Objective 2.6: At least 30% of the students were expected to show improvement on the evaluation level (Appendix E).

An analysis of the results revealed that 55% of the students showed improvement on the evaluation level and a gain of 32%. The projection for this objective was achieved (Table 2).

Table 2

Percentage of Children Achieving Mastery of Thinking Skills

Cognitive Level	Pre-Evaluation	Post-Evaluation	Difference*
1. Knowledge	71	92	21
2. Comprehension	58	88	30
3. Application	41	85	44
4. Analysis	33	68	35
5. Synthesis	31	57	26
6. Evaluation	23	55	32
mean	42	74	32

*Positive (Gain)

The mean score for the pre-evaluation of cognitive levels of thinking was 42%; the mean score for the post-evaluation of the cognitive levels of thinking was 74%. An overall gain of 32% was obtained.

Conclusions

A summary of the results of this practicum implementation indicates that all objectives were successfully accomplished. By organizing a thinking skills program and providing adequate staff development training, the project revealed what many educators have known for years. Designing a thinking skills program is an appropriate procedure for facilitating cognitive development and leads students to extend cognitive processes to higher levels of thinking.

Because of the success and innovativeness of the project, it is expected to become a functioning component of Mini City's curriculum.

Recommendations

Based upon a survey of related literature (Nickerson, Perkins, and Smith, 1985) and the coordinator's experience in organizing and implementing a thinking skills program, the following recommendations are suggested:

1. Before starting a thinking skills program one must be clear about his objectives. The objectives should be few in number and very specific.
2. Specific short-range objectives should be selected and supportive to long-range objectives.
3. Caution should be made in reference to adopting a program that is close to what one wants but does not quite address it.
4. The teacher must search for ways to make a connection between her effort to teach thinking skills and what is being taught in the classroom.

5. In assessing performance on a cognitively demanding task, the teacher should try not only to determine whether a student succeeds or fails at the task, but, if he fails, to determine why.
6. The question of how best to teach thinking is one that one should not expect ever to be answered in any final sense. No matter how well thinking is taught at any given time, there will - should - be a desire to teach it better (Nickerson, Perkins and Smith, 1985, p. 345).

Dissemination

The solution strategies of the practicum were shared with all the faculty members at Mini City School. All schools in the county have received practicum abstracts (Appendix Q).

Plans are being made to present the practicum implementation to North Carolina Central University Graduate School of Education and to the local School Board of Education in the fall of 1987. In 1988 the practicum implementation is expected to be presented at the State ASCD and the National ASCD Conferences.

Finally, in view of the effort and timeliness of developing and implementing this meaningful practicum, the intention is to submit a copy to the Clearinghouse on Elementary and Early Childhood Education for its consideration for inclusion in the Educational Resources Information Center (ERIC). If approved, it could become a valuable resource for many teachers and professionals throughout the country.

REFERENCES

Anderson, L.W. (1983). Introduction. In R. Bossone (Ed.). Proceedings: The Fourth Conference of the University Urban Schools National Task Force: The fourth R: reasoning. New York: Center for Advanced Study in Education, The Graduate School and University Center of The City of New York.

Association of Supervision and Curriculum Development Update (1984). ASCD 1984 Resolutions. Alexandria, VA: Author.

Baron, J. (1985). Rationality and intelligence. New York: Cambridge University Press, 1985.

Beyer, B.K. (1983). Common sense about teaching thinking skills. Educational Leadership, 41 (3), 44-49.

Beyer, B.K. (1984). Improving thinking skills - Practical Approaches. Phi Delta Kappan, 65 (8), 556-560.

Beyer, B.K. (1985). Teaching critical thinking: a direct approach. Social Education, 49 (4), 297-303.

Bloom, B.S.; Engelhart, M.D.; Furst, E.J.; Hill, W.H.; & Krathohl, D.R. (Eds.) (1954). Taxonomy of educational objectives: Cognitive Domain. New York: Longman, Inc.

Bondy, E. (1984). Thinking about thinking: Encouraging children's use of metacognitive processes. Childhood Education, 60 (4) 234-238.

Brandt, R. (1984). Learning about thinking. Educational Leadership, 42 (3), 3.

Brandt, R. (1985). Comparing approaches to teaching thinking. In A.L. Costa (Ed.) Developing minds: A resource book for teaching thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

Brandt, R. (1986). Talks on teaching thinking. (Audiotape), Alexandria, VA. Association for Curriculum Development.

Brooks, M. (1984). A constructivist approach to staff development. Educational Leadership, 42 (3), 23-27.

Brown, J.L. (1983). On teaching thinking skills in the elementary and middle school. Phi Delta Kappan, 64 (10), 708-714.

Charles, C.M. (1974). Teacher's petit Piaget. Belmont, CA: Pitman Learning, Inc.

Cortes, C.E. & Richardson, E. (1983). 'Why in the world': Using television to develop critical thinking skills. Phi Delta Kappan, 64 (10), 715-716.

Costa, A.L. (1981). Teaching for Intelligent Behavior. Educational Leadership, 39 (1), 29-33.

Costa, A.L. (1984). Mediating the metacognitive. Educational Leadership, 42 (3), 59-62.

Costa, A.L. (Ed.) (1985). Developing minds: a resource book for teaching thinking: Alexandria, VA: Association for Supervision and Curriculum Development.

Day, M.C. (1981). Thinking at Piaget's stage of formal operation. Educational Leadership, 39 (1), 44-46.

de Bono, E. (1983). The direct teaching of thinking skills. Phi Delta Kappan, 64 (10), 703-708.

Dewey, J. (1933). How we think. Boston: D.C. Heath and Co.

Dunn, R.; Dunn, K.; & Price, G.E. (1977). Diagnosing learning styles against school systems. Phi Delta Kappan, 62(6), 418-20.

Education Commission of the States. (1982). Denver, CO.

Ehrenberg, S.D. (1981). Concept learning: How to make it happen in the classroom. Educational Leadership, 39 (1), 36-43.

Ehrenberg, S.D. & Ehrenberg, L.M. (1982). BASICS: Building and applying Strategies for intellectual competencies in students. Coshocton, OH: Institute for Curriculum and Instruction.

Ehrenberg, S.S. (1985). BASICS. In A. L. Costa (Ed.), Developing minds: a resource book for teaching Thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

Feuerstein, R. (1979). Instrumental enrichment. Baltimore, MD: University Park Press.

Feuerstein, R. (1986). Cognitive development. (Audio-tape) Alexandria, VA: Association for Curriculum Development.

Garmston, R. (1985). Are teachers motivated to teach thinking? In A.L. Costa (Ed.) Developing minds: a resource book for teaching thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

Glade, J.J. & Citron, H. (1985). Strategic Reasoning. In A. L. Costa (Ed.), Developing minds: a resource book for teaching thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

Glatthorn, A.A. and Baron, J. (1985). The good thinker. In A.L. Costa (Ed.), Developing minds: a resource book for teaching thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

Glickman, C. (1985) Supervision of instruction: developmental approach. New York: Allyn Bacon.

Goodlad, J.A. (1984). A place called school: prospects for the future. New York: McGraw Hill.

Guilford, J.P. (1967). The Nature of Human Intelligence. New York: McGraw-Hill.

Hobbs, N. (1980). Feuersteins's Instrumental Enrichment; teaching intelligence to Adolescents. Educational Leadership, 37 (7), 566-568.

Hughes, C. (1985). Foreword. In A.L. Costa (Ed.) Developing minds: a resource book for teaching thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

Hunter, M. (1983). Mastering teaching. El Segundo, CA: Tip Publications.

Kurfman, D. & Cassidy, E. (1977). Developing decision-making Skills. Arlington, VA: The National Council for the Social Studies.

Lipman, M. (1985). Philosophy for children. In A.L. Costa (Ed.) Developing minds: a resource book for teaching thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

McCarthy, B. (1981). The 4mat system: teaching to learning styles with right/left mode techniques. Barrington, IL: Excel, Inc.

McCarthy, B. (1985). What 4 mat training teaches us about staff development. Education Leadership, 42 (7), 61-68.

McCarthy, B. (1986). The 4mat system. Barrington, IL: Excel, Inc.

McTighe, J. & Schollenberger, J. (1985). Why teach thinking: a statement of rationale. In A.L. Costa (Ed.) Developing minds: a resource book for teaching thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

Mechling, K.R. and Oliver, D.L. (1983). Handbook IV. What research says about elementary school science. Clarion, PA: Clarion University of Pennsylvania.

Meeker, M.N. (1969). The structure of intellect. Columbus, OH: Charles E. Merrill Publishing Co.

Meeker, M.N. (1985). SOI. In A.L. Costa (Ed.) Developing minds: a resource book for teaching thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

National Science Board Commission on Pre-College Education in Mathematics, Science, and Technology (1983). Educating Americans for the 21st century. Washington, DC: Author.

Nicely, Jr., R.F. (1985). Higher-order thinking skills in mathematics textbooks. Educational Leadership, 42 (7), 26-30.

Nickerson, R., Perkins, D., Smith, E. (1985). The teaching of thinking. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

North Carolina Department of Public Instruction. (1985) Competency Based Curriculum for K-12. Raleigh, NC: Author.

Ornstein, R. (1980). Concept Paper. The Institute for the Study of Human Knowledge. Los Altos, CA. Author.

Paul, R.W. (1985). Dialectial Reasoning. In A.L. Costa (Ed.) Developing minds: a resource for teaching thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

Perkins, D.N. (1984). Creativity by design. Educational Leadership, 41 (1), 18-24.

Piaget, J. (1953). Logic and psychology. New York: Basic Books.

Pogrow, S. (1985). HOTS. A computer-based approach. In A.L. Costa (Ed.) Developing minds: a resource book for teaching thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

Presseisen, B.Z. (1985). Thinking skills: meaning and models. IN A.L. Costa (Ed.) Developing minds: a resource book for teaching thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

Rosenshine, B. (1970). Enthusiastic teaching, a research review. School Review 78 (1), 279-301.

Rowe, M.B. (1974). Wait-time and rewards as instructional variables: their influence on language, logic, and fate control. part 1. wait-time. Journal of Research in Science Teaching, 11 (1), 81-94.

Sternberg, R.J. (1981). Intelligence as thinking and learning skills. Educational Leadership, 39 (1), 18-20.

Taba, H. (1966). Teaching strategies and cognitive functioning in elementary school children. Washington, DC: US Office of Education.

Taba, H.; Levine, S. & Elzey, F.F. (1964). Thinking in elementary school children. Washington, DC: US Office of Education.

Will, H. (1984). You must think if you wish to read interpretively. Childhood Education, 60 (4), 246-248.

Winocur, S.L. (1985). Project IMPACT. In A.L. Costa (Ed.) Developing minds: a resource book for teaching thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

Wright, E. (1985). Odyssey. A curriculum for thinking. In A.L. Costa (Ed.) Developing minds: a resource book for teaching thinking. Alexandria, VA: Association for Supervision and Curriculum Development.

APPENDIX A

NEEDS ASSESSMENT SURVEY ON THINKING SKILLS

Self-Reflection on Your Teaching:
A Checklist

Using a scale of 1 to 5, rate your classroom and school according to the following items.

5 = Very Often 4 = Often 3 = Sometimes 2 = Seldom 1 = Hardly Ever

CLASSROOM

1.	When students pose unusual or divergent questions, I ask, "What made you think of that?"	5	4	3	2	1
2.	Whatever the text says is accepted as the right answer.	5	4	3	2	1
3.	When a decision has to be made between involving the class in a discussion of an intriguing student idea (topic related) or moving on to "cover" content, I choose the latter.	5	4	3	2	1
4.	I encourage students to seek alternative answers.	5	4	3	2	1
5.	Students give reasons for making statements.	5	4	3	2	1
6.	I use subject matter as a means for students to generate their own questions (or problems), which we then seriously consider.	5	4	3	2	1
7.	When teaching, I sit or stand behind my desk.	5	4	3	2	1
8.	Most questions posed during class can be answered with short or one-word answers.	5	4	3	2	1
9.	Students spontaneously engage in critiquing each other's thinking.	5	4	3	2	1
10.	Students relate subject matter to experiences in other subjects or in their personal lives.	5	4	3	2	1
11.	I stress <u>what</u> to think, not <u>how</u>.	5	4	3	2	1
12.	Students often set objectives for their own learning.	5	4	3	2	1
13.	Students spend time working collaboratively to solve subject matter questions.	5	4	3	2	1

14.	One focus in my classroom is trying to understand how and why people (mentioned in texts) created ideas, solutions, experiments, rules, principles, and so on.	5	4	3	2	1
15.	My classroom mirrors the patterns of involvement practices in most faculty meetings.	5	4	3	2	1
16.	Students actively listen to each other.	5	4	3	2	1

SCHOOL

17.	We talk about the nature of thinking.	5	4	3	2	1
18.	My school stresses collaborative instructional problem solving.	5	4	3	2	1
19.	I learn from my colleagues by observing their teaching.	5	4	3	2	1
20.	My supervisor and I discuss how to challenge students to think in more complex fashions.	5	4	3	2	1

* John Barell, "Self-Reflection on Your Teaching: A Checklist," Developing Minds - A Resource Book for Teaching Thinking. Edited by Arthur L. Costa (1985): 315-316. Reprinted by permission of the Association for Supervision and Curriculum Development and John Barell. Copyright (c) 1985 by the Association for Supervision and Curriculum Development. All rights reserved.

APPENDIX B

TEACHERS SELF-EVALUATION CHECKLIST ON THINKING SKILLS

How Thoughtful Is Your Classroom*

Using the following 14 questions as your criteria, rate your classroom's effectiveness in developing thinking skills.

		Degree of Effectiveness (5 = high 1 = low)				
1.	Do your community and you value thinking as a primary goal of education?	5	4	3	2	1
2.	Do you believe that with appropriate intervention human intelligence can continue to grow throughout life?	5	4	3	2	1
3.	Have you reached consensus on or adopted a model of intellectual function?	5	4	3	2	1
4.	Are students aware that intelligent behavior is an instructional objective?	5	4	3	2	1
5.	Does your language (questioning and structuring) invite students to think?	5	4	3	2	1
6.	Do your response behaviors extend and maintain higher levels of thinking?	5	4	3	2	1
7.	Are learning activities arranged in order of increasing complexity and abstraction?	5	4	3	2	1
8.	Do instructional materials support higher cognitive functioning?	5	4	3	2	1
9.	Is adequate instructional time devoted to thinking?	5	4	3	2	1
10.	Does instruction provide for differences in modality strengths?	5	4	3	2	1
11.	Are concepts and problem-solving strategies encountered repeatedly throughout, across, and outside the curriculum?	5	4	3	2	1
12.	Do students and you discuss their thinking (metacognition)?	5	4	3	2	1

13.	Do evaluation measures assess intelligent behavior?	5	4	3	2	1
14.	Do you model intelligent behaviors?	5	4	3	2	1

*Arthur L. Costa, "How Thoughtful Are Your Classrooms", Developing Minds - A Resource Book for Teaching Thinking. Edited by Arthur L. Costa (1985): 317-318. Reprinted by permission of the Association for Supervision and Curriculum Development and Arthur L. Costa. Copyright (c) 1985 by the Association for Supervision and Curriculum Development. All rights reserved.

APPENDIX C

PARTICIPANT EVALUATION OF THE STAFF DEVELOPMENT ACTIVITY*

Instructions

Each participant in this staff development activity should evaluate the quality of the activity by checking whether he/she Strongly Agrees, Agrees, is Undecided, Disagrees, or Strongly Disagrees with each of the statements below.

Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	
					1. The activity objectives were related to my educational concerns.
					2. The activity objectives were related to practical educational application in my specific job setting.
					3. The activity had some outstanding components which were unique or innovative.
					4. Presentations were well organized.
					5. The program schedule was well adapted to my educational needs.
					6. My questions were satisfactorily answered by personnel conducting activity.
					7. Meeting facilities were suitable.
					8. The strategies utilized, including instructional resources, were appropriate for meeting the stated objectives.
					9. Overall, personnel conducting the activity exhibited the qualities essential to the success of the workshop. (Consider creativity, specialized knowledge, communication skills, and the like.)
					10. Overall, the activity was a successful training experience for me.
					11. Adequate provisions were made for me to provide feedback to the personnel conducting the workshop.
					12. Adequate provisions were made for me to identify needs which were not previously identified.
					13. As a result of this staff development activity, I will alter my educational behavior in a more positive direction in my specific job setting.

Comments: _____

_____

_____

_____

_____

JEH/shw
4/78

*Reprinted by permission of the North Carolina Department of Public Instruction.

APPENDIX D

Classroom Observation Checklist *

S. Lee Winocur

Teacher _____ School _____ District _____

Observer _____ Subject _____ Date _____

Directions:

Mark an "x" in the appropriate column for each classroom behavior. If the statement is generally true of this classroom, mark *yes*. If the statement is generally not true of this classroom, mark *no*. If you are unsure, mark the third column.

	Yes	*No*	*Unsure*
Affective Disorders			
1. FOSTERS A CLIMATE OF OPENNESS			
• Eye contact is frequent between teacher and students, and students and students.	_____	_____	_____
• Teacher moves around the room.	_____	_____	_____
• Students listen attentively to others.	_____	_____	_____
• Teacher calls on students by name.	_____	_____	_____
2. ENCOURAGES STUDENT INTERACTION/COOPERATION			
• Students work in pairs or small groups.	_____	_____	_____
• Students respond to other students.	_____	_____	_____
• Students help others analyze and solve problems.	_____	_____	_____
3. DEMONSTRATES ATTITUDE OF ACCEPTANCE			
• Teacher accepts all valid student responses.	_____	_____	_____

	Yes	*No*	*Unsure*
• Teacher uses symbolic language to illustrate a point (simile, metaphor).	_____	_____	_____
• Teacher uses outlining.	_____	_____	_____
10. MODELS REASONING STRATEGIES			
• Teacher uses "if/then" language.	_____	_____	_____
• Teacher poses "what if" or "suppose that" questions.	_____	_____	_____
• Teacher uses clear examples to facilitate logical thought.	_____	_____	_____
11. ENCOURAGES TRANSFER OF COGNITIVE SKILLS TO EVERYDAY LIFE			
• Teacher encourages transfer at end of lesson with comments like, "This will help you in your everyday life in this way. . . ."	_____	_____	_____
12. ELICITS VERBALIZATION OF STUDENT REASONING			
• Teacher poses questions at different levels of Bloom's Taxonomy.	_____	_____	_____
• Teacher allows at least ten seconds wait time for student answer before restating or redirecting the question.	_____	_____	_____
• Teacher asks students to clarify and justify their responses.	_____	_____	_____
• Teacher probes "I don't know" responses.	_____	_____	_____
• Teacher reinforces students for responding to open-ended questions.	_____	_____	_____
13. PROBES STUDENT REASONING FOR CLARIFICATION			
• Teacher asks questions to elicit reasoning by students.	_____	_____	_____
• Teacher requires students to expand on answers.	_____	_____	_____
• Teacher cues students for most logical answers.	_____	_____	_____
14. ENCOURAGES STUDENTS TO ASK QUESTIONS			
• Teacher poses problematic situations.	_____	_____	_____
• Teacher withholds "correct" responses; encourages students to explore possibilities.	_____	_____	_____
• Teacher encourages students to answer other students' questions.	_____	_____	_____
15. PROMOTES SILENT REFLECTION OF IDEAS			
• Teacher allows time for reflection.	_____	_____	_____

*S. Lee Winocur, "Classroom Observation Checklist," Developing Minds - A Resource Book for Teaching Thinking. Edited by Arthur L. Costa (1985): 317-318. Reprinted by permission fo the Association for Supervision and Curriculum Development and S. Lee Winocur. Copyright (c) 1985 by the Association for Supervision and Curriculum Development. All rights reserved.

Copyright 1983 by Project IMPACT, Orange County Department of Education, Costa Mesa, California

	Yes	*No*	*Unsure*
• Incorrect student responses elicit encouraging, supportive comments.	_____	_____	_____
• Teacher acknowledges student comments with a nod or other signal.	_____	_____	_____

Cognitive Indicators

4. Encourages Students to Gather Information
   - Reference materials are readily available. _____ _____ _____
   - Students use reference materials. _____ _____ _____
   - Student mobility is allowed to obtain information. _____ _____ _____
   - Teacher acts as facilitator. _____ _____ _____
   - Students record data in notebooks or journals. _____ _____ _____

5. Enourages Students to Organize Information
   - Teacher works from organized lesson plans. _____ _____ _____
   - Students classify and categorize data. _____ _____ _____
   - Students take notes systematically. _____ _____ _____
   - Teacher's presentation is logical, organized. _____ _____ _____
   - Ideas are graphically symbolized during instruction. _____ _____ _____

6. Encourages Students to Justify Ideas
   - Teacher probes for correct responses. _____ _____ _____
   - Teacher seeks evidence for stated claims. _____ _____ _____
   - Students analyze sources of information for reliability, relevance. _____ _____ _____
   - Teacher frequently asks, "Why do you think so?" _____ _____ _____
   - Students relate learning to past experience or similar situations. _____ _____ _____

7. Encourages Students to Explore Alternatives and Others' Points of View
   - Teacher establishes expectations for divergent solutions. _____ _____ _____
   - Teacher allows time to consider alternatives/points of view. _____ _____ _____
   - More than one student is queried for point of view/solution. _____ _____ _____
   - Teacher asks students to justify and explain their thoughts. _____ _____ _____

8. Asks Open-Ended Questions
   - Teacher asks open-ended questions with multiple answers *as frequently as* single-answer questions. _____ _____ _____

9. Provides Visual Cues for Developing Cognitive Strategies
   - Teacher appropriately uses a variety of visual media (charts, chalkboard, maps, pictures, gestures). _____ _____ _____

APPENDIX E

THINKING SKILLS TEST

Name_____ Date_____

THINKING SKILLS TEST - Grade 3
Goldilocks and the Three Bears

KNOWLEDGE LEVEL

1. Why did the Three Bears decide to take a walk?

_____

_____

2.&3. List two things that Goldilocks did in the Three Bears' home.

(1)_____

_____

(2)_____

_____

4. Which Bear had a deep, heavy voice? _____

COMPREHENSION LEVEL

1. Why did Goldilocks like the Baby Bear's chair best?

_____

_____

2. What is meant by middle-sized?

_____

_____

3. What is the opposite of the term lie down?

_____

4. What made Goldilocks jump through the window?

_____

_____

APPLICATION

1. If Goldilocks had come to your house what are some of the things that she might have used?

2. Name another food besides porridge that is served hot and is eaten from a bowl during breakfast.

3. What might the Three Bears have done as they walked through the woods?

4. If there had been a huge jet in the Three Bears' yard, which bear would most likely own it?

ANALYSIS

1. What parts of the story could have actually happened?

2. What parts of the story could not have actually happened?

3. What hints in the story may suggest that the bears had a cock stove?

4. In what season of the year do you think the story took place?

_____

Why do you think so?

_____

_____

SYNTHESIS

1. How might the story be different if Goldilocks had visited the three fish?

_____

_____

2. If the Baby Bear had a bike what might Goldilocks have done with his bike?

_____

_____

3. What can Papa Bear and Mama Bear do to help Baby Bear feel better?

_____

_____

4. If the Three Bears take a trip again what will they most likely do differently before they leave their home?

_____

_____

EVALUATION

1. Do you think Goldilocks was bad or good? _____
Why do you think so?

_____

_____

2. Should Goldilocks have walked through the woods? _____
   Why or why not?

_____

_____

3. What should a <u>good</u> papa bear do?

_____

_____

4. What should a <u>good</u> mama bear do?

_____

_____

APPENDIX F

REQUEST FOR PERMISSION TO REPRINT

Irene S. Robinson
424 Halifax Street
Warrenton, North Carolina 27589

August 5, 1986

Ms. Deborah Johnson, Permission Editor
Association for Supervision and Curriculum Development
125 North West Street
Alexandria, Virginia 22314-2798

Dear Ms. Johnson:

This letter follows-up our previous telephone conversation concerning permission for me to include charts and checklists from certain ASCD publications.

I am a doctoral candidate in the Early Childhood Education Program at Nova University, Fort Lauderdale, Florida. As a major requirement for this degree, a major practicum is involved, and, I have selected "Teaching Thinking Skills" as my primary focus.

While reviewing the pertinent literature on the topic, I came across some charts and checklists in the book, Developing Minds (1985), and in the recent issues of Educational Leadership. I would like your written permission to include a few of these charts and checklists in my final written document for possible inclusion in the ERIC retrieval system as a dissemination for other interested educators.

Your assistance and cooperation in granting such permission is highly appreciated.

Sincerely,

Irene S. Robinson

APPENDIX G

PERMISSION TO REPRINT

Irene S. Robinson
424 Halifax Street
Warrenton, North Carolina 27589

August 5, 1986

Ms. Deborah Johnson, Permission Editor
Association for Supervision and Curriculum Development
125 North West Street
Alexandria, Virginia 22314-2798

Dear Ms. Johnson:

This letter follows-up our previous telephone conversation concerning permission for me to include charts and checklists from certain ASCD publications.

I am a doctoral candidate in the Early Childhood Education Program at Nova University, Fort Lauderdale, Florida. As a major requirement for this degree, a major practicum is involved, and, I have selected "Teaching Thinking Skills" as my primary focus.

While reviewing the pertinent literature on the topic, I came across some charts and checklists in the book, Developing Minds (1985), and in the recent issues of Educational Leadership. I would like your written permission to include a few of these charts and checklists in my final written document for possible inclusion in the ERIC retrieval system as a dissemination for other interested educators.

Your assistance and cooperation in granting such permission is highly appreciated.

Sincerely,

Irene S. Robinson

Irene S. Robinson

OK
Deborah Johnson
Permissions Editor
8/15/86

ASSOCIATION FOR SUPERVISION
AND
CURRICULUM DEVELOPMENT
125 North West Street
Alexandria, VA 22314

PERMISSION TO REPRINT MATERIALS COPYRIGHTED BY ASCD

Materials copyrighted by ASCD may not be reprinted except under the following conditions. These provisions are intended to encourage dissemination of the materials while also protecting rights of the authors and the Association.

A. Educators may reproduce a single article without making a written request provided that (1) duplication is for an educational purpose in a not-for-profit institution, (2) copies are made available without charge beyond the cost of reproduction, and (3) each copy includes full citation of the source. Permission to reproduce more than one article will be granted under the same conditions to those who make a reasonable request in writing.

B. Authors will be granted permission to reprint material they have written provided that they request permission in writing.

C. Not-for-profit publishers of professional or scholarly materials will be granted permission to reprint or quote from Association publications without payment of royalty if the Association and the author approve their written requests. Permission is unnecessary for passages of 100 words or less, but full citation of the source must be given in any case.

D. Commercial publishers or editors of anthologies to be published commercially are expected to pay a royalty fee in order to be granted permission to reprint. The author of the material may also charge a royalty if he/she chooses.

FORMS OF CITATION

All citations are to include the words, "Reprinted with permission of the Association for Supervision and Curriculum Development.
Copyright (c) (date) by the Association for Supervision and Curriculum Development. All rights reserved."

Example:

Harold G. Shane, "The Rediscovery of Purpose in Education," Educational Leadership 28 (March 1971): 581-584. Reprinted with permission of the Association for Supervision and Curriculum Development and Harold G. Shane. Copyright (c) 1971 by the Association for Supervision and Curriculum Development. All rights reserved.

APPENDIX H

CALENDAR PLAN FOR ACTION

The following schedule was prepared for designing, implementing, and evaluating an effective thinking skills program.

June/July, '86

* Discuss practicum plans with school personnel.
* Secure needs assessment questionnaire.
* Continue to review the literature.
* Administer needs assessment questionnaire.

August, '86

* Obtain implementation approval.
* Continue to review the literature.
* Administer pre-evaluation to teachers.
* Secure inservice presenters.
* Present overview to faculty.
* Present first inservice workshop: A Rationale to Teach Thinking.
* Evaluate the inservice workshop for effectiveness
* Present audio-tape: Cognitive Development I by Reuven Feuerstein.
* Initiate thinking skills activities for classrooms.

September, '86

* Administer pre-evaluation to students.
* Present second inservice workshop: Strategies to Promote Higher-Order Thinking.
* Evaluate inservice workshop for effectiveness.
* Observe teaching.
* Incorporate Junior Great Books program for third grade.

* Follow-up on staff development strategies with teachers.

* Receive classroom evaluations from the observer.

* Continue to review the literature.

* Work on thinking skills activities.

* Receive feedback from teachers.

October, '86

* Present third inservice workshop: Ways to Improve Student Thinking/Teaching Demonstration.

* Evaluate inservice workshop for effectiveness.

* Continue to review literature.

* Attend NC-AEYC; Attend session on thinking and learning.

* Continue to follow-up on Junior Great Books activities with third grade.

* Continue to work on higher-order thinking skills activities.

November, '86

* Continue to review the literature.

* Informally observe teachers for the teaching of thinking effectiveness and for formation of thinking skills activities.

* Continue to work on thinking skills activities.

* Continue Junior Great Books Program with third grade.

* Receive teachers feedback.

December, '86

* Present fourth inservice workshop: Enhancing the Metacognitive Processes.

* Evaluate the inservice workshop for effectiveness.

* Continue to review the literature.

* Present audio-tape: Classroom Conditions That Encourage Student Thinking.

* Continue Junior Great Book Program with third grade.
* Follow-up on activities with teachers.

* Continue work on thinking skills activities.

* Continue feedback from teacher.

January, '87

* Present fifth inservice workshop: Characteristics of a Good Thinker.

* Evaluate workshop for effectiveness.

* Continue to review the literature.

* Present audio-tape: Approaches to Teaching Thinking by Ron Brandt.

* Allow peer observations of teaching.

* Continue to complete higher-order thinking skills activities.

* Continue Junior Great Books Program for third grade.

* Continue teacher feedback.

February, '87

* Present sixth inservice workshop: The 4 Mat System.

* Evaluate workshop for effectiveness.

* Continue a literature review.

* Continue Junior Great Books Program for third grade.

* Monitor thinking activities for third grade.

* Continue to add to higher-order thinking skills activities.

* Continue teacher feedback.

March, '87

* Present seventh inservice workshop: Products of Inquiry.

* Evaluate workshop for effectiveness.

* Continue a literature review.

* Continue Junior Great Books Program for third grade.

* Allow peer observation of teaching.

* Continue to work on higher-order thinking skills activities.

* Continue teacher feedback.

April, '87

* Present eighth inservice workshop: Wrap-Up Session.
* Continue a literature review.
* Continue Junior Great Books Program for third grade.
* Continue teacher feedback.
* Continue to work on higher-order thinking skills activites.

May, '87

* Continue program activities in classrooms.
* Complete observations by local observer.
* Complete summative evaluation of program.
* Award teacher certificates to teachers.
* Have a thinking skills party.
* Submit report.
* Disseminate abstract.

APPENDIX I

The "Basics" of Tomorrow: *

- Evaluation and analysis skills
- Critical thinking
- Problem-solving strategies (including mathematical problem-solving)
- Organization and reference skills
- Synthesis
- Application
- Creativity
- Decision-making given incomplete information
- Communication skills through a variety of modes

—Education Commission of the States, 1982

*Ronald Brandt, "The Need to Teach Children to Think," Developing Minds - A Resource Book for Teaching Thinking. Edited by Arthur L. Costa (1985): 331. Reprinted by permission of the Associaiton for Supervision and Curriculum Development and Ronald Brandt. Copyright (c) 1985 by the Association for Supervision and Curriculum Development. All rights reserved.

APPENDIX J

National Assessment Results *

17 Year Olds

Reading		
• Read for inferences	1971—64%	1980—62%
• Analyze a passage for mood	1971—51%	1980—41%
Writing		
• Write persuasively	1974—21% competent	1979—15% competent
Mathematics		
• Understand mathematics	1973—62%	1978—58%
• Apply mathematics	1973—33%	1978—29%
Science		
• Classify (physics)		1977—44%

"The pattern is clear: the percentage of students achieving higher order skills is declining."

Percent not competent ranges from 38% to 85%.

—Education Commission of the States, 1982

*Ronald Brandt, "The Need to Teach Children to Think," Developing Minds - A Resource Book for Teaching Thinking. Edited by Arthur L. Costa (1985): 332. Reprinted by permission of the Association for Supervision and Curriculum Development and Ronald Brandt. Copyright (c) 1985 by the Association for Supervision and Curriculum Development. All rights reserved.

Reading, Thinking, and Writing *

A four-step model of the comprehension process:

1. Initial comprehension, leading to
2. Preliminary interpretations, followed by
3. A reexamination of the text in light of these interpretations, leading to
4. Extended and documented interpretation

Only 5 to 10% move beyond Step 2.

"Students seem satisfied with their initial interpretations of what they have read and seem genuinely puzzled at requests to explain or defend their points of view. Few students could provide more than superficial responses to such tasks, and even the "better" responses showed little evidence of well-developed problem-solving strategies or critical-thinking skills."

—National Assessment of Reading and Literature, 1979-80

*Ronald Brandt, "The Need To Teach Children To Think," Developing Minds - A Resource Book for Teaching thinking. Edited by Arthur L. Costa (1985): 333.

Reprinted by permission of the Association for Supervision and Curriculum Development and Ronald Brandt. Copyright (c) 1985 by the Association for Supervision and Curriculum Development. All rights reserved.

A Place Called School

—John Goodlad

Reports "A Study of Schooling"

- 38 schools, 13 communities, 7 regions
- 20 data collectors, 30 days per community
- over 1,000 classrooms

Classroom Talk

Instruction = 75% of class time

Talk = 70% of instruction

Teacher Talk

Invited open response (reasoning, opinion) = 1%

—John Goodlad, p. 229.

*Ronald Brandt, "The Need To Teach Children to think," Developing Minds - A Resource Book for Teaching Thinking. Edited by Arthur L. Costa (1985): 334-335. Reprinted by permission of the Association for Supervision and Curriculum Development and Ronald Brandt. Copyright (c) 1985 by the Association for Supervision and Curriculum Development. All rights reserved.

APPENDIX M

BLOOM'S TAXONOMY OF COGNITIVE SKILLS

Levels of Complexity *

					EVALUATION
				SYNTHESIS	SYNTHESIS
			ANALYSIS	ANALYSIS	ANALYSIS
		APPLICATION	APPLICATION	APPLICATION	APPLICATION
	COMPREHENSION	COMPREHENSION	COMPREHENSION	COMPREHENSION	COMPREHENSION
KNOWLEDGE	KNOWLEDGE	KNOWLEDGE	KNOWLEDGE	KNOWLEDGE	KNOWLEDGE

LEVELS OF COMPLEXITY

1. Knowledge — Recall; memory; facts
2. Comprehension — Understanding; translation
3. Application — Use information to solve a problem in a new situation
4. Analysis — Take apart, look for similarities, compare/contrast
5. Synthesis — Put together a unique creation (NEW) invention
6. Evaluation — Judgements - more than opinion, support with reason

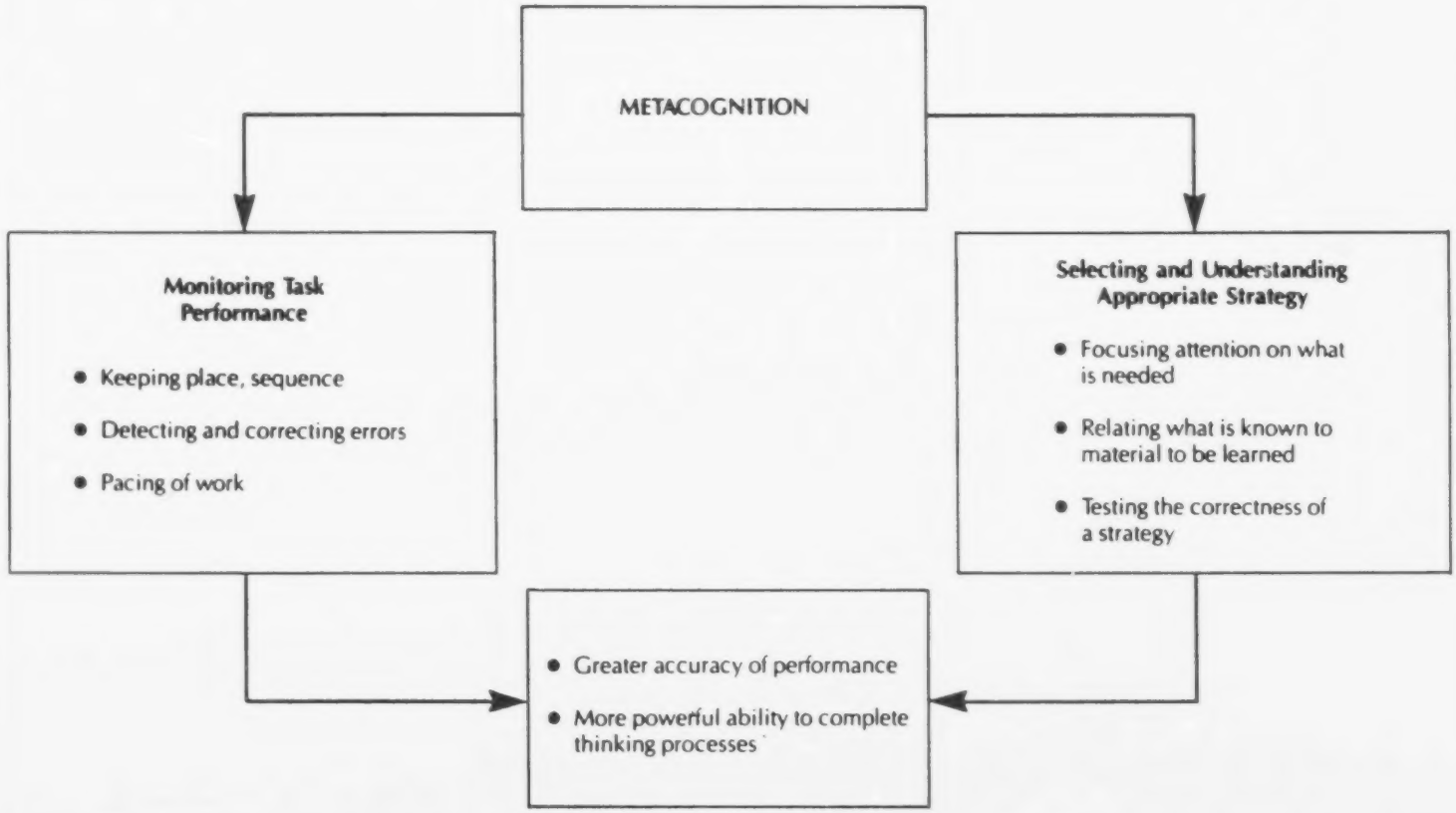
* COMPLEXITY = Thought process required
DIFFICULTY = Effort required

Ways to Improve Student Thinking *

1. Ensure that students process information.
2. Ask broad, open questions.
3. Wait before calling on students.
4. Follow up student responses by asking for: clarification, elaboration, evidence, thinking process.
5. Have a clear purpose, plan a sequence of activities to accomplish it.
6. Make students conscious of their own thinking processes.
7. Model problem solving and other thinking processes.
8. Have students ask questions of their own.

*Ronald Brandt, "Improving The Quality of Student thinking," Developing Minds - A Resource Book For Teaching Thinking. Edited by Arthur L. Costa (1985): 337. Reprinted by permission of the Association for Supervision and Curriculum Development and Ronald Brandt. Copyright (c) 1985 by the Association for Supervision and Curriculum Development. All rights reserved.

A Model of Metacognitive Thinking Skills *


METACOGNITION
Monitoring Task Performance
• Keeping place, sequence
• Detecting and correcting errors
• Pacing of work
Selecting and Understanding Appropriate Strategy
• Focusing attention on what is needed
• Relating what is known to material to be learned
• Testing the correctness of a strategy
• Greater accuracy of performance
• More powerful ability to complete thinking processes

*Barbara Z. Presseisen, "Thinking Skills: Meanings and Models," Developing Minds - A Resource Book for Teaching Thinking. Edited by Arthur L. Costa (1985): 47. Reprinted by permission of the Association for Supervision and Curriculum Development and Barbara Z. Presseisen. Copyright (c) 1985 by the Association of Supervision and Curriculum Development. All rights reserved.

112

MINI CITY SCHOOL
MINI CITY - USA

CERTIFICATE OF COMPLETION

JOHN DOE

IS RECOGNIZED FOR HAVING COMPLETED TEN HOURS OF INSTRUCTON IN THE THINKING SKILLS PROGRAM

COORDINATOR _____ DATE _____

APPENDIX Q

SAMPLE MEMO OF DISSEMINATION

116

TO: Mini City Educators

FROM: Irene S. Robinson

RE: THINKING SKILLS PROGRAM

I have recently submitted a written Practicum report to the Faculty of the Early Childhood Education Program of Nova University, Fort Lauderdale, Florida, in candidacy for the degree of Doctor of Education.

The practicum was designed to organize and implement a thinking skills program with emphasis on higher-order thinking skills. The implemented program was beneficial to both teachers and students.

I have attached a copy of the abstract of the practicum report. If you have any further questions or wish to receive fur..er information regarding this report, please feel free to contact me.

ISR/nt

Enc.